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Thesis

THE RESULT OF DEFERRING SYSTEMATIC TEACHING OF ARITHMETIC TO GRADE SIX AS DISCLOSED BY THE DEFERRED FORMAL ARITHMETIC PLAN AT MANCHESTER, NEW HAMPSHIRE.

Submitted by
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(B.S. Boston University 1932)

In partial fulfillment of requirements for the
degree of Master of Education
1935

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Miss	Crowther	Lincoln	"
"	Dunnington	Wilson (Prin.)	"
"	McCarthy	Wilson	"
"	McGuire	Bakersville	"
"	Merrill	Wilson	"
"	Murry	Hallsville	"
"	Quigley	Highland	"
"	Stewart	Youngsville (Prin.)	

To Dr. Louis P. Benezet, Supt. of Schools, Manchester, N. H. she acknowledges her appreciation for the freedom of the schools and for his cooperation during the study.

STATEMENT OF THE AUTHOR

The purpose of this study has been to check the experiment at Manchester, New Hampshire, in order to find out whether the attempt to defer systematic arithmetic from grade one to grade six is justifiable. It is with this objective that this thesis is mainly concerned.

The underlying purpose in the preparation of all material has been to test possibilities rather than to secure high results but it is gratifying to state that the study shows high attainments as well as possibilities.

It is hoped that this study will be of interest and help to others and that it will create new interests for those who still think that improvement is in order.

I. INTRODUCTION

A. The Need For Research:

If one were to ask for the aims and objectives of arithmetic, there would be a wide range of opinions. The truth of the matter is, most people have come to no real basic conclusions. Most people accept the traditional attitude. They feel that arithmetic must be taught. They strive for high results and oft times classify the child as dumb, if he gets the wrong answer or gives evidence of mental confusion. They feel that some time or other, the child will need what they are attempting to teach him and, therefore, go on with their usual routine of getting the material stored away for the future. They even get exasperated when results do not meet their expectations. Have they really given the matter the consideration which it merits? Have they really analyzed the objectives of arithmetic of the past and of the present, or have they blindly accepted and continued to insist on mechanical results? An analysis of the past status of arithmetic permits of a comparison and serves as an indicator of our present direction.

"At the time of the colonization of America in the first half of the seventeenth century, arithmetic was not considered essential to a boy's education (as we know, the girl had no consideration) unless he was to enter commercial life or certain trades. The instruction in arithmetic was often given in a separate school, called a reckoning school. When arithmetic was taught in the grammar schools, it was very rudimentary. Not only was this true, but among the nobility

I. INTRODUCTION

A. The Need For Research

and the aristocracy of the educated, arithmetic was looked upon as 'common', 'vile', 'mechanic' because it was the accomplishment of clerks, artisans, tradesmen, and 'others who bore no signs of heraldry'. Consequently, it was a subject beneath the dignity of a boy unless he was 'less capable of learning and fittest to be put to trades'. Such was arithmetic and the place it occupied in education in Europe at the time when the American colonies were settled. The colonists had grown to maturity in European environment and had been educated in European schools. When they came to America, they brought with them traditions and ideals which influenced their schools and their plan of education. The first settlements in New York were made by the Dutch West India Co.....a nation which had attained such commercial prominence could not neglect arithmetic .....the Dutch colonists brought with them this attitude toward Arithmetic."[1].

Have we ever stopped to raise the question as to whether or not we have over-estimated the importance of certain phases of arithmetic or its function in the curriculum? A study of its development discloses the fact that "it is difficult for the teachers of today to realize that Arithmetic has not always been one of the fundamentals of the school curriculum. There is the general impression that the curriculum consisted of the three R's until it was enriched by the addition of the more modern subjects. Hence we fail to appreciate that it was not until the second quarter of the 19th Century that arith-

1. Development of Arithmetic as a School Subject.
W. S. Monroe Wash. Gov. Print. Office 1917 P. 5 and P. 53

metic was accorded its place in our schools."[1.]

Records of the past handed down on tablets and papyrus, as well as the tally of England (the use of flat pieces of wood in which sums of money were indicated by notches, the debtor kept one part and the creditor the other) show that it was mostly the merchants of the time who really needed arithmetic. Today, our complex society demands that we facilitate and establish ways of carrying on our business relations. We feel the need for established methods but in our anxiety to prepare to meet this need, we lose all track of the fact that arithmetic began as a difficult subject with adults and has now found its way into the lower grades to be dealt with in a mechanical cramming fashion.

Although there has been a gradual awakening to the need for improving arithmetic, yet on the whole, most changes seem to have taken place within the traditional curriculum itself. However, there are those who feel that only by going beyond the present bounds of conservatism can we receive the greatest returns for our endeavors.

The "progressive" movement in arithmetic has attained sizable proportions. From many platforms, we hear about "the futility of the arithmetic grind". Noting the growth of this movement, conservatives have come to the rescue, defending the arithmetic of the past and present. This "progressive" movement has great significance in the opinion of the Department of Superintendents who believe that arithmetic is not an

1. Development of Arithmetic as a School Subject
W. S. Monroe Wash. Gov. Print. Office 1917 P.53

end in itself but rather a tool to meet the demands of social utility. They believe that three phases of arithmetic need attention, first, that of the basic experience necessary in order to make manipulative work meaningful; second, the mastery for automatic reproduction of the useful number facts; and third, training in application to life and business situations. It is their conclusion that there is needed a set of criteria and a means of checking so that drill may not proceed on a meaningless basis.[1.]

The first extensive study of business usage was made in 1918.[2.] This study contends that arithmetic in the grades is justified only on the basis of its utility in the common affairs of life and that we learn multiplication tables not to sharpen the wits nor to comprehend a beautiful system, but to figure our bills, our taxes, or the interest on a note. "Whatever arithmetic is given in the grades beyond the essentials required by social utility consumes time that could be used more profitably in other ways. More and more the work in arithmetic should direct attention to the use of judgment in spending, using and saving money." "There are so many real situations that we should not waste time on artificial ones."

It is due to this trend of thinking and a realization that the emphasis must be placed on comprehension first, that formal arithmetic has been left out of the first grade in Indiana, California and in grades one and two in Massachusetts.

1. Dept. of Supt. Third Yearbook June 1926 Fourth Yearbook Feb. 1926
2. What Arithmetic Shall We Teach. G. M. Wilson 1927

Under the circumstances, it is very natural that a progressive superintendent should propose a fundamental experiment. In the case of Supt. Benezet, it takes the form of deferring systematic arithmetic to Grade VI. Supt. Louis P. Benezet, of the Manchester, New Hampshire schools, is one of those who believes that there is still much to be done in the matter of revising the teaching of arithmetic. He has been conducting a study in deferring formal arithmetic to Grade VI and it is therefore with his experiment that this thesis is concerned. The study takes the form of a control experiment, in which children of the deferred arithmetic group are compared with an equal number of children who have had arithmetic in the traditional amounts, grades 1 to 5 inclusive.

II. THE PROBLEM AND THE PLAN

A. TO SECURE A CHECK:

The purpose of this study was to check the experiment of deferring the systematic teaching of arithmetic to Grade Six and to note what was actually taking place, also, to determine whether the attempt to economize in arithmetic from Grades one to six is justifiable.

This study called for the observation of both experimental and regular program groups in order to note how the experimental children, who had had no formal instruction not even the formal learning of tables, would compare with those who had continued the usual arithmetic plan for five years. This study further embodied the observation of how quickly these experimental children would learn and how both groups, experimental and regular, would compare at given periods of time.

B. TO SET UP MEANS FOR THE CHECKING:

The checking was to be done by means of tests which were to be given to both groups, the regular and the experimental, at given periods of time. If this study had been contemplated approximately three and a half months earlier when school actually began, it would have been the general plan to give a test immediately in September to the experimental entering sixth grade pupils to determine how much incidental arithmetic these pupils had acquired both in and out of school. However, since school had already begun and the experimental pupils had begun the systematic learning of arithmetic, it was left to obtain entering sixth grade data at the mid-year

promotion time, when a new class would enter the sixth grade. This was later done and used as a basis upon which to study gains and to make comparisons.

(1) The first tests were, therefore, to be given at once to note how much formal arithmetic these experimental pupils, now approximately three and a half months in the sixth grade, had gained since school began in September and to note the deficiency as compared with the regular program pupils. This first comparison was to be made between the two groups but would also be judged later in the light of its own gain based on entering figures (secured, as has been referred to above, at the mid-year promotion). The Wilson Process Inventory Tests, which included five distinct tests on examples in addition, subtraction, multiplication, short division and long division, were the first to be given. Each test was devoted to examples under one process only.

(2) The second tests were to be given approximately three months later to note the gain made by each group over its own previous record and also to make a comparison between the two groups themselves, the experimental and regular. The second tests were to consist of examples made from the five distinct Inventory Tests. (This was termed Composite Test L) At this time, also, the Wilson General Survey Test I was to be given and consisted of all fundamentals under one test. This would serve as a basis for comparison with the Wilson General Survey II which would follow.

(3) The third tests were to be given approximately three months later than the second tests to note the gains made by the experimental and regular groups over their own two previous records and also to make possible a comparison of the accomplishments of both groups. These third tests consisted of another Composite II Test made from the examples of the Inventory Tests and also a Composite III which was to be original with the writer and to be on the same principle as the two previous composite tests. At this time, also, the Wilson General Survey II Test was to be given to show the gain of each group over Survey I.

(4) Immediately following mid-year promotion, the Wilson Process Inventory Tests were to be given to the beginning sixth grade experimental pupils. (As has already been stated, the purpose was to estimate the actual standing of the experimental pupils had a test been given to them in September.

(5) Detailed data were to be secured from the teachers and pupils of both groups in order to properly make an analysis of the findings and to serve later in arranging matched pairs for the two groups. This data was to include the child's date of birth, health, arithmetic history, grade history (normal, advanced, or retarded progress), occupation of father, occupation of mother, if any, and any other related information. The teacher was also to check the material to be handed in and also to give her estimate of the pupil's general class rating.

(6) The Kuhlman-Anderson Test and the Haggerty Test Delta II were to be given to provide group intelligence test data as an aid in arranging the pairs.

(7) The Experimental and Regular groups were to be paired off according to the personal information given by teacher and pupils together with the mental scores on the Kuhlman-Anderson and Haggerty Test Delta II tests.

C. SCOPE OF STUDY

(1) Number of Schools and their status:

This study was conducted in the Sixth Grade of eight rooms of seven different schools of very similar backgrounds. Four of these rooms have had no formal arithmetic at all (as nearly as attainable) and have been termed experimental while the other four, termed regular, have been instructed according to the regular program. Although both groups, experimental and regular, consisted of four rooms yet the number of regular program children are greater due to the fact that there were fewer children in the experimental rooms. Other experimental rooms in the city had not yet reached the sixth grade or were of a much different background. In the final comparative grouping, however, equal numbers have been used. The background of the seven schools in the experiment may be classed as average and for the most part is representative of cotton mill or shoe factory workers.

(2) Classification of Schools:

Experimental	Regular
Bakersville	Hallsville
Highland	Spring
Lincoln	Wilson Room 1.
Youngsville	Wilson Room 2.

(c) The Kuhlman-Anderson Test and the Haggerty Test
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(5) Classification of Schools:

Experimental	Regular
Bakersville	Hallsville
Highland	Spring
Lincoln	Wilson Room 1.
Youngsville	Wilson Room 2.

D. METHOD OF PROCEDURE

(1) Meeting with Teachers:

A meeting was held with the teachers of the eight rooms for the purpose of organizing and securing their cooperation in giving the tests. Each teacher engaged in the experimental work has been free to work out her own plan for sixth grade work with the understanding that at the end of two years these children must be ready for high school work, therefore, no specific directions were given except to cover the usual work.

It was explained that tests would be given to note the progress made.

(2) Dates When Tests Were Given:

The Wilson 3P addition, and 4P subtraction tests, were given immediately following the teachers' meeting, December 6 and 7, 1932 to allow no time for preparation. Due to a delay in receiving the tests from the publishers and also because of the intervention of the Christmas vacation, the multiplication, short division, and long division tests were given January 6, 9, and 10, 1933. Although these tests were late in being given as just explained, nevertheless, they were still in advance of the arithmetic programs planned by the EXPERIMENTAL teachers.

After the above tests were given, the EXPERIMENTAL teachers were asked to give an account of the work accomplished to date, and to tell whether or not they had anticipated the multiplication, short division, and long division tests or had taught anything in advance of their original plans. The teachers were also asked

to state any personal reactions to the study.

The Kuhlman-Anderson and Haggerty Delta II Tests were given January 11 and 12, 1933 in order to secure a mental score which was to be used in the grouping of pupils for comparative results.

The second group of tests consisted of Composite I and Wilson Survey Form I and were given March 16 and 17, 1933. The objective was to note differences and to see how much had been gained since the last tests (January 10, 1933).

The third group of tests consisted of Composite II, Composite III, and Wilson Survey Form II and were given May 17, 18, and 19, 1933. The objective was to note differences and to see how much gain had finally been made during the year of instruction.

Tests were also given to the mid-year entering sixth grade experimental class of February to see what they had gained through incidental teaching or outside information.

Summarized the dates stand as follows:

I	December 6 and 7, 1932 January 6, 9, and 10, 1933 January 11 and 12, 1933	Addition and Subtraction Multiplication, S. Div. L. Div. Kuhlman-Anderson and Haggerty Delta II Tests.
II	March 16 and 17, 1933	Composite I and Wilson Survey I
III	May 17, 18, and 19, 1933	Composite II, CompositeIII Wilson Survey II
IV	February 1933	Wilson "P" Tests to Mid-year entering Experimental pupils.

In the light of the dates given, the accomplishments may also be considered within the following time:

Group I Tests. Represents approximately three and one-half months since the opening of school in September when formal arithmetic, which included teaching the tables, was begun.

Group II Tests. Represents a little over two months since the first test was given.
Tests covered process work in the fundamentals combined.

Group III Tests. Represents a little over two months since the second test was given.
Tests covered process work in the fundamentals and more difficult material.

All tests were given in all schools involved in the study, viz., four experimental rooms and four regular rooms, a total of eight rooms.

III. THE GROUPS AND THE COMPARATIVE DATA

The background of both the EXPERIMENTAL and REGULAR groups are very similar and represent the average working class of a mill city. The following represents the occupations of parents of both groups:

Table 1.

FATHER:

EXPERIMENTAL		REGULARS	
Baker	1	Broken Home	1
Barber	3	Baker	3
Candy Maker	1	Building Inspector	2
Clerk	3	Bookkeeper	1
Carpenter	2	Bridge Builder	1
Depot--Freight	1	Carpenter	5
Electrician	1	Cemetery Worker	1
Fruit Wholesale	1	Cigar Maker	1
Fireman	2	Cook	1
Florist	1	Credit Man (Armour Co.)	1
Fruit Peddler	1	Electrician	2
Gardener	2	Electrical Engineer	1
Laborer, City	2	Farmer	4
Laundry	1	Florist	1
Lumber Dealer	1	Fruit Store	1
Machinist	1	Furniture	1
Manager, Branch	1	Insurance	2
Mechanic	1	Junk Store	1
Poultry Dealer	4	Janitor	1
Railway, Street	1	Lunch Cart	1
Representative	1	Mechanic	8
Salesman	2	Merchant	4
Shoe Shop	17	Mill	19
Sign Co. Owner	1	Monumental Worker	1
Telephone	1	Moving Picture Operaror	1
Truck Driver	2	Office (Coal)	1
Watchman, Mill	1	Policeman	1
Father Missing	1	Poultry Dealer	1
Mill	18	Printer	1
Not Living	4	Railroad	1
Shoemaker	3	Roofer	1
		Salesman	3
		Shipper	1
		Shoe Shop	22
		Store	1
		Tannery	1
		Telephone	1
		Truck, Bread	1
		Not living	4
		Missing	1
Total	82	Total	106

MOTHER:

Clerk	1	Bakery	1
Farm	1	Cook (Restaurant)	1
Home	58	Clerk	1
Mill	13	Farm	1
Not living	2	Home	83
Storekeeper	1	Housekeeper	1
Shoe Shop	2	Housework	1

III. THE GROUPS AND THE CONTRADICTORY DATA

The background of both the EXPERIMENTAL and REGULAR groups are very similar and represent the average working class of a mill city. The following represents the occupations of parents of both groups:

Table I.

PARENTS

EXPERIMENTAL		REGULAR	
Baker	1	Broken Home	1
Barber	2	Baker	2
Candy Maker	1	Building Inspector	2
Clerk	3	Bookkeeper	1
Carpenter	3	Brick Builder	1
Driver--Freight	1	Carpenter	6
Electrician	1	Cemetery Worker	1
Fruit Specialist	1	Glass Blower	1
Foreman	2	Cook	1
Florist	1	Credit Man (Armour Co.)	1
Fruit Peddler	1	Electrician	1
Grocer	2	Electrical Engineer	1
Laborer, City	2	Farmer	4
Laundry	1	Florist	1
Lumber Dealer	1	Fruit Store	1
Machinist	1	Furniture	1
Mapper, Branch	1	Insurance	2
Mechanic	1	Junk Store	1
Poultry Dealer	2	Janitor	1
Railway, Street	1	Lunch Cart	1
Representative	1	Mechanic	6
Salesman	1	Salesman	6
Shoe Shop	17	Mill	16
Sign Co. Owner	1	Monumental Worker	1
Telephone	1	Motor Fixture Operator	1
Truck Driver	2	Office (Coal)	1
Watchman, Mill	1	Policeman	1
Rubber Mixing	1	Poultry Dealer	1
Mill	18	Painter	1
Not Living	4	Retired	1
Unemployed	2	Roofer	1
		Salesman	2
		Shipper	1
		Shoe Shop	2
		Store	1
		Tannery	1
		Telephone	1
		Truck, Bread	1
		Not Living	4
		Unemployed	2
Total	36	Total	106

MOTHER:			
Grocer	1	Bakery	1
Farm	1	Cook (Restaurant)	1
Home	29	Clerk	1
Mill	15	Farm	1
Not Living	1	Home	25
Housekeeper	1	Housekeeper	1
Shoe Shop	1	Housework	1

(Table 1. Continued)

Experimental		Mothers	Regular	
Tannery	1		Mill	11
Teacher (Printing)	1		Office	1
Works Out	1		Stocklining	1
With Grandmother	1		Shoe Shop	3
			Not living	1
Total	82		Total	106

Careful study of Table 1. indicates clearly that the two groups belong to the same general occupational level. They are a random sampling of the usual occupations in an industrial city. The fact that a larger percentage of the mothers in the Experimental Group are engaged in occupations outside the home might seem to indicate that the Experimental Group is slightly lower in social status. On the other hand 17 of the Experimental fathers are in shoe shops, 22 of the Regulars, while 18 of the Experimental are in mills and 19 of the Regulars are also. In general, therefore, it seems fair to conclude that from the standpoint of social status and general background the two groups are equal.

This study is in the nature of a control experiment.[1] The pupils are paired into two equivalent groups on the basis of background and mental age. The first step, therefore, has been to check the groups for equality on the basis of social background.

1. How to Experiment in Education. W. A. McCall P.45

(Table 1. Continued)

Experimental	Workers	Regular
Tannery	1	Mill 14
Teacher (retired)	1	Office 1
Works Out	1	Shoemaking 1
with Grandmother	1	Shoe Shop 8
		Not living 1
Total	25	Total 100

Careful study of Table 1. indicates clearly that the two groups belong to the same general occupational level. They are a random sampling of the usual occupations in an industrial city. The fact that a larger percentage of the workers in the Experimental Group are engaged in occupations outside the home might seem to indicate that the Experimental Group is slightly lower in social status. On the other hand 17 of the Experimental fathers are in shoe shops, 25 of the Regulars, while 18 of the Experimental are in mills and 12 of the Regulars are also. In General, therefore, it seems fair to conclude that from the standpoint of social status and general background the two groups are equal.

This study is in the nature of a control experiment. The pupils are paired into two equivalent groups on the basis of background and mental age. The first step, therefore, has been to check the groups for equality on the basis of social background.

1. How to Experiment in Education. W. A. McCall p.45

Preceding the giving of the various tests there was no attempt at paired grouping. The complete data from the tests is contained in Table X in the Appendix for the Experimental group and Table Y for the Regular group. These two tables give the complete data for each child covering the age, the teacher's rating of pupil, intelligence scores, arithmetic history, and the results of the various tests in arithmetic together with the dates at which the tests were given.

By the use of the McCall technique[1] 34 pairs of girls were carefully chosen as shown in Table 2, and 27 pairs of boys as shown in Table 3. Tables 2 and 3 therefore become the basic tables of the present study.

Table 2 follows herewith:

1. How to Experiment in Education. McCall P.45-49

preceding the giving of the various tests there was no attempt at paired grouping. The complete data from the tests is contained in Table X in the Appendix for the experimental group and Table Y for the regular group. These two tables give the complete data for each child covering the age, the teacher's rating of pupil, intelligence scores, arithmetic history, and the results of the various tests in arithmetic together with the dates at which the tests were given.

By the use of the McCall technique 24 pairs of girls were carefully chosen as shown in Table Z, and 27 pairs of boys as shown in Table S. Tables X and S therefore become the basic tables of the present study.

Table S follows herewith:

1. How to Experiment in Education. McCall p.45-49

Table 2. Showing Scores and Data on Experimental Girls at the Left and the Comparable Paired Regular Girls at the Right, 34 Each.
Instructions for reading this table are given on page 23.

| | | |

Table 2 consists of paired groups of Girls.

Table 3 " " " " " Boys.

Tables 2 and 3 are read beginning at the left as follows:

Column	1.	Experimental pupil's school and number
"	2.	Pupil's age
"	3.	Weighted score which consists of teacher's estimate of pupil, and scores on Kuhlman-Anderson and Haggerty Delta 2 Tests.
"	4.	Results of Wilson 3P Test (Addition) December 6, 1932
"	5.	" " " 4P " (Subtraction) December 7, 1932
"	6.	" " " 5P " (Multiplication) Jan. 6, 1933
"	7.	" " " 6P1 " (Short Div.) Jan. 9, 1933
"	8.	" " " 6P2 " (Long Div.) Jan.10, 1933
"	9.	The average of all Wilson P (Process) Tests
"	10.	Addition results on Wilson General Survey Form I Mar.17,1933
"	11.	Subtraction " " " " " " "
"	12.	Multiplication " " " " " " "
"	13.	Division " " " " " " "
"	14.	Fractions " " " " " " "
"	15.	Business Arithmetic " " " " " "
"	16.	Total Score " " " " " "
"	17.	Addition " " Wilson General Survey Form II May 19/33
"	18.	Subtraction " " " " " " "
"	19.	Multiplication " " " " " " "
"	20.	Division " " " " " " "
"	21.	Fractions " " " " " " "
"	22.	Business Arithmetic " " " " " "
"	23.	Total Score " " " " " " "
"	24.	Results of Composite Test I March 16/33
"	25.	" " " " II May 17/ 33
"	26.	" " " " III May 18/33
"	27.	Average of all Composite Tests
"	1'.	Regular pupil's school and number
"	2'-27'	(Repetition of columns 2-27) Paired.

Table 2 gives a detailed account of the paired groups of Girls in order to make comparisons and note differences. These results have been taken from the general tables. Tables X and Y of the Appendix.

Table 3 gives a detailed account of the paired groups of Boys treated the same as for the paired boys.

Table 2. permits a direct comparison of the Experimental Girls with the Regular Girls. Comparing the summary at the bottom and using column 2 under experimental and 2' under regular, we observe that the average age for the experimental group is 11.39 with the Standard Deviation .86. The girls in the regular group have an average age of 11.55 with Standard Deviation .99. In other words from the standpoint of age, the two groups are closely identical. General identity of groups is reinforced by matching pairs. The first girl in the experimental group B7 is 11 years 1 month and is matched up with W6 the first girl in the regular group who is also 11years and 1 month, and so throughout the table, the pairs are matched as to age.

Comparing in a similar way column 3 under the experimental girls with 3' under the regular, we find that the weighted score on the various intelligence tests are carefully matched. Girl 1 experimental has a score of 502, girl 1 regular 504.11 and so throughout the table, the pairs are matched as to weighted score.

Thus the attempt is made to carefully match a girl in the experimental group with a girl of equal age and equal intelligence in the regular group. The further data of Tables 2 and 3 relate more specifically to arithmetic and show the progress of the individual in the two groups through the various tests given during the year.

The weighted scores shown in column 3 and 3' of Table 2 are scores derived from Table X and Y of the Appendix. For instance the first girl in the experimental group B7 of

Table 2 is the same girl as B7 (#7) in Table X of the Appendix. The B7 weighted score 503.81 is secured from columns 2-4-5-6 of Table X by selecting multipliers which would give equal weighted items. The measure of variability was secured and used as a multiplier.[1.]

Table 2 for the experimental and the comparable columns 4' 5' 6' 7' 8' 9' for the regulars show for the latter part of December and the first part of January a comparison between the two groups on the fundamental processes. The tests used were the Wilson Process Tests 3P, 4P, 5P, 6P1. and 6P2. (See exhibit tests in the Appendix.) These tests are difficult enough to indicate sufficient mastery of the respective processes provided they are completed within a recent time and without counting or the saying of the tables. The surprising thing is that the experimental girls after 3½ months of teaching of the fundamental processes make an average score of 80.30 as against the regular average score of 91.75 on the Wilson Process Tests. In addition as shown at the bottom of columns 4 and 4' the experimental group had a score of 92.60 as against the score for regulars 91.30. In other words, the experimental group were equal to the regular group in addition. In subtraction, they were about 9 points below, in multiplication about 9 points below, while in short division and long division their difference was considerably greater.

This would seem to indicate that children when not

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being regularly taught tend to learn addition. The explanation is that they doubtless need addition enough in daily life to justify learning it. There is of course the possibility that these children were taught considerably by their parents or older brothers and sisters.

On the other hand, long division seems to lag far behind with the experimental group indicating either lack of usage or lack of teaching or a more difficult process requiring more time.

A different type of test, the Wilson General Survey Test, was given to the two groups on March 17. The data for the experimental group are contained in columns 10 through 16 of Table 2 and the comparable data for the regular girls in columns 10' through 16'. The perfect score for a section of the General Survey Test is 50. (See exhibit test in Appendix for sample of General Survey Form I and Form II.) Comparing the two groups on the General Survey Form I, we find that the two groups at the middle of March were practically identical in simple addition. On all other processes, the regulars were ahead of the experimentals and the difference was much greater in division, particularly in long division. The difference on total scores in the two tests was a difference of 25.40. (See columns 16 and 16'.)

A second form of the Wilson General Survey Test was given the two groups on May 19 shown in columns 17 through 23 for the experimental girls and 17' through 23' for the regular girls. Here again the two groups were equal in

addition as shown by the average in column 17 and 17'. They were approximately equal in subtraction and in multiplication. In division the difference is very small. There was still sizable difference in favor of the regulars in fractions. The totals for the tests showed for the regulars a favorable difference of 15.45 out of a total possible score of 300.

The Composite Tests reported on in columns 24-25-26-27 for the experimental girls and 24' 25' 26' 27' for the regulars is shown under the Appendix exhibits. This test, as will be seen by examination in the Appendix, covers all the four fundamental processes in a form a little more difficult than in the Wilson Process Test. It appears therefore as a fair general check at the close of the year. The use of the Composite Tests shows that the experimental group in March had a total score of 92.95 as shown at the bottom of column 24 against 95.75 for the regulars as shown at the bottom of 24'. In other words, in March the regulars were a little ahead; in May, two forms were used and the average at the bottom of columns 25 and 26 compared with the average of columns 25' and 26' shows that in May the two groups were almost identical in scores on this particular test.

Table 3 shows the paired grouping of 27 experimental boys against 27 regular boys. With the boys as with the girls, the effort was made to get in each pair two boys as nearly equal one to the other as possible using age, teacher's rating, and two intelligence test measures as a basis. The averages at the bottom show the experimental boys with an average age of 11.38 against that of the regular boys 11.36. The weighted

score for the experimental boys was the average of the weighted scores 486.95 against 486.40 for the regular boys.

The comparison of experimental boys and regular boys runs very similar to the comparison of girls just made as based upon Table 2. Columns 4 and 4' of Table 3 show that in addition the experimental boys in December were almost equal to the regular boys in addition. Columns 5 and 5' show that the experimental boys were only about $2\frac{1}{2}$ points below the regular boys in subtraction. In multiplication and division the differences were greater and in long division still greater. The scores on the General Survey Tests in March as shown in columns 10 to 16 for the experimental boys and 10' to 16' for the regular boys shows that in addition, subtraction, and multiplication in March, the experimental boys were very nearly even with the regular boys. In division the difference was larger and in fractions still larger. On the other hand, the experimental boys were equal to the regular boys in comprehension of simple business situations as shown by the averages of columns 15 and 15' of Table 3. In May, the differences in the Wilson General Survey Tests were slightly less than in March. The total scores in March were 235.80 and 216.85 or a difference of 18.95 while in May, the difference was only 10.

As with the girls so with the boys, the differences were less on the Composite Tests. The score of the experimental boys on the Composite Tests in May as shown by the average at the bottom of columns 24 to 26 and 24' to 26' were less than 2 points.

Table 3. Showing Scores and Data on Experimental Boys at the Left and the Comparable Paired Regular Boys at the Right, 27 Each.
(Instructions for reading this table are given on Page 23.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Name	Age	Weighted Score	Wilson Inv.-Dig. Tests Dec. 6 1932 3P	Dec. 7 1932 4P	Jan. 4 1933 5P	Jan. 9 1933 6P1.	Jan. 10 1933 6P2.	Average	Wilson Gen. Survey Form I March 17, 1933 Add	Subt.	Mult.	Div.	Frac.	Bus. Arith.	Total Score	Wilson Gen. Survey Form II May 19, 1933 Add	Subt.	Mult.	Div.	Frac.	Bus. Arith.	Total Score	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average
H16	10-10	526.16	98	100	96	100	96	98	50	50	50	40	21	47	258	50	49	30	42	34	40	245	98	90	100	96
L17	13-0	520.17	84	92	77	57	82	78.40	50	46	47	34	6	31	214	48	50	36	42	13	12	201	88	80	84	84
H11	10-9	514.44	90	92	87	89	80	87.60	39	39	46	34	34	30	222	49	40	14	37	5	40	185	78	78	82	79.34
H13	10-10	513.12	100	100	97	98	98	98.60	50	50	36	50	48	20	254	50	50	40	45	50	10	245	100	96	94	96.67
Y12	11-5	511.34	88	82	67	92	66	79	50	50	30	35	2	31	198	50	45	39	50	20	22	226	98	94	98	96.67
B18	11-4	510.16	98	100	87	98	94	95.40	50	50	27	45	18	31	221	50	45	37	50	32	30	244	100	100	98	99.34
H14	10-10	508.35	100	100	95	93	86	94.80	50	42	40	50	34	20	236	50	45	34	50	11	20	210	88	98	94	93.34
Y1	11-1	507.30	88	73	43	80	58	68.40	50	50	48	42	6	37	233	48	50	35	42	16	16	207	98	100	100	99.34
L14	10-10	498.91	93	96	86	75	80	86	50	50	40	26	36	27	229 absent	46	45	35	34	39	40	239	88	54	88	76.67
B29	10-9	498.89	72	33	57	73	12	48.20	38	17	4	19	-	17	incomplete	38	20	23	24	0	36	141	58	62	70	63.34
Y3	10-4	495.92	70	68	73	44	10	53	50	43	50	48	6	50	247	50	50	47	50	28	24	249	92	90	100	94.
L15	10-6	495.30	98	97	90	98	98	96.20	42	47	47	33	24	37	230	41	50	40	50	50	41	272	94	100	92	95.34
L5	10-11	488.74	79	91	63	42	16	58.20	45	47	27	24	6	33	182	50	50	36	29	30	5	200	74	88	82	81.34
B19	11-3	488.66	88	99	85	86	86	88.20	50	38	27	45	9	31	200	50	45	50	50	34	40	269	90	100	90	93.34
L1	12-7	487.63	96	88	74	30	60	69.60	50	50	38	50	50	38	191	50	46	24	25	36	42	223	88	72	88	82.67
Y17	11-1	485.63	95	91	63	74	14	67.40	50	50	40	45	13	47	245	50	50	40	50	29	20	239	96	96	100	97.34
Y11	11-4	483.67	95	83	84	85	50	79.40	50	50	40	50	0	32	222	50	50	42	41	24	24	231	98	98	98	98
B24	12-7	481.48	91	84	74	48	80	75.40	43	23	23	24	2	32	147	48	15	24	28	9	36	160	84	88	94	88.67
Y8	11-1	477.08	98	81	89	56	6	66	50	50	50	50	4	23	227	50	50	50	50	13	34	247	100	98	100	99.34
B10	11-2	470.38	92	100	89	93	92	93.20	46	50	40	34	10	30	210	50	50	37	50	21	38	246	96	98	96	96.67
B17	10-5	466.68	86	86	68	63	88	78.20	47	46	21	29	30	32	195	38	40	38	37	22	12	187	74	88	96	86
B4	12-0	457.67	96	99	92	89	90	93.20	50	50	50	42	15	39	246 absent	44	40	43	50	10	32	219	94	88	100	94
B14	11-2	453.72	84	93	64	60	16	63.40	41	46	23	21	-	25	incomplete	39	45	38	42	0	33	197	90	90	92	90.67
B13	10-11	450.44	95	98	85	89	92	91.40	50	42	43	50	16	32	233	38	50	25	42	23	26	204	92	96	98	95.34
L3	12-8	450.18	97	72	84	42	26	64.20	42	35	26	17	0	0	120 absent	46	34	47	23	6	5	161	72	74	82	76.
B2	11-3	445.55	78	63	50	62	28	56.20	50	50	21	23	-	43	incomplete	46	40	37	29	0	20	172	64	82	84	76.67
B5	11-2	437.50	96	98	91	90	80	91.	50	50	50	32	6	39	227	50	50	46	36	26	17	225	100	100	100	100
Med.	11.15	448.13																								
Av.	11-3	476.95	94.38	91.20	89.30	85.60	82.50	91.25	50	49.90	41.25	37.70	37.50	14.50	32.95	45.75	46.40	38.25	42.92	22.50	28.75	222.50	92.08	88.80	93.13	94.58	93.50
S.D.	1.09	24.15	8.50	14.45	14.55	20.30	28.05	15.10	4.90	9.	22.5	11.70	15.20	13.01	29.05	5.35	8.65	9.15	10.30	13.55	11.20	32.05	12.05	11.65	8.05	9.25

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Name	Age	Weighted Score	Wilson Inv.-Dig. Tests Dec. 6 1932 3P	Dec. 7 1932 4P	Jan. 4 1933 5P	Jan. 9 1933 6P1.	Jan. 10 1933 6P2.	Average	Wilson Gen. Survey Form I March 17, 1933 Add	Subt.	Mult.	Div.	Frac.	Bus. Arith.	Total Score	Wilson Gen. Survey Form II May 19, 1933 Add	Subt.	Mult.	Div.	Frac.	Bus. Arith.	Total Score	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average
S14	13-2	517.66	98	99	97	97	88	95.80	50	50	50	50	45	40	285	50	50	40	42	36	23	241	100	96	100	98.67
S17	13-9	530.13	79	86	71	95	64	79	47	33	26	34	15	23	178	50	36	37	34	18	19	194	82	78	82	80.67
W14	10-9	515.12	90	99	82	88	88	89.40	50	42	40	34	38	29	233	48	45	35	49	34	35	246	96	92	98	95.34
H20	10-10	504.42	90	96	99	82	88	89	41	50	38	42	48	47	266	47	50	27	50	45	26	245	98	96	90	94.67
W17	11-10	521.18	84	91	89	85	84	86.60	50	50	50	40	32	33	255	47	50	47	42	12	29	227	90	88	98	92
H6	11-0	504.76	95	93	88	94	90	92	50	49	40	50	43	40	272	50	35	27	34	37	38	221	98	90	92	93.34
H36	10-9	514.29	95	91	82	75	86	85.80	50	46	50	44	47	17	234	46	50	25	29	9	40	199	94	96	96	95.34
H13	11-1	535.91	96	95	98	98	92	95.80	50	50	50	50	48	36	284	50	50	40	42	44	25	251	98	98	98	98
H1	10-9	491.34	97	90	83	98	98	93.20	50	38	30	48	44	39	249	50	45	26	50	38	40	249	96	92	100	96
W8	10-8	492.64	94	99	89	98	90	94	50	50	30	50	10	28	218	48	45	15	37	39	26	210	90	92	90	90.67
W15	10-4	491.45	93	96	95	97	94	95	50	50	40	50	45	39	274	41	47	40	50	30	34	242	98	94	98	96.67
W4	10-6	496.69	84	78	82	96	86	85.20	50	46	30	45	48	39	258	50	50	37	50	48	42	277	96	98	96	96.67
H32	10-10	482.73	93	93	73	95	96	90	45	42	36	50	42	42	259	46	40	39	41	18	43	207	98	90	94	94
W44	11-2	492.20	98	93	98	93	98	96	47	50	40	50	36	47	240	50	50	50	50	38	35	273	94	100	94	96
S6	12-5	465.98	98	79	63	59	38	67.40	46	32	21	21	30	47	197	48	36	29	26	7	33	179	76	74	64	71.34
H38	11-1	488.36	91	87	87	90	98	90.60	50	40	40	50	20	31	231	46	34	28	49	23	26	206	98	94	90	94
W16	10-11	482.85	93	95	79	87	88	88.40	50	50	36	34	43	37	240	46	50	30	34	28	42	230	96	96	96	96
H26	11-9	481.51	97	98	94	96	96	96.20	50	50	50	50	24	29	253	50	50	40	50	12	25	227	98	68	96	87
W30	10-11	464.07	98	96	83	81	96	90.80	47	46	44	37	16	39	229	50	50	40	49	30	30	247	96	90	98	94.67
W47	11-5	472.70	92	96	90	96	94	93.60	50	39	38	48	42	6	205	44	50	34	37	27	40	232	100	92	98	96.67
H28	14-7	466.84	96	94	91	97	96	94.80	50	50	30	49	33	29	241	50	50	25	50	40	14	229	98	98	96	97
W33	11-8	455.41	98	92	97	95	84	93.20	50	50	50	42	24	34	250	50	50	50	50	27	50	277	94	100	98	97.34
W34	12-6	454.96	84	92	86	84	90	87.20	38	50	40	37	0	38	203	50	50	33	50	0	30	213	96	86	96	92.67
W29	12-1	451.33	81	88	92	89	92	88.40	50	46	27	42	10	35	210	39	40	35	41	12	33	200	96	92	88	92
H39	12-6	456.56	93	68	71	57	48	67.40	38	30	23	23	6	17	137	50	32	46	24	4	34	180	70	82	86	79.34
W37	12-2	454.08	95	86	89	78	72	84	41	42	40	24	10	34	191	45	45	31	24	9	17	171	76	74	94	81.34
H12	10-11	431.77	97	95	92	100	96	96	50	50	50	42	47	22	261	50	50	40	40	47	20	247	98	98	100	98.67
Med.	11.03	457.50																								
Av.	11.36	486.40	94.72	93.80	93.61	89.90	87.92	93.50	50.	46.85	50	45.20	36.50	43.75	235.80	50	50	36.50	43.75	28.17	30.50	244.17	96.41	93.25	96.25	94.72
S.D.	1.26	27.10	3.95	6.70	9.05	11.15	14.70	7.70	4.65	6.70	7.75	10.40	14.90	8.20	33.70	3.85	6.55	8.50	9.55	14.25	6.10	28.15	7.35	8.65	7.60	6.55

Table 5 shows in column form the medians, Averages, and Standard Deviations of the above table.

Table 4. This table shows the Medians, Averages, and Standard Deviations for the paired groups of girls.

	EXPERIMENTAL GIRLS			REGULAR PROGRAM GIRLS			For Reg.
	Med.	Av.	S. D.	Med.	Av.	S. D.	
Age	11.23	11.39	.86	.34	11.55	.99	+ .16
Weighted Score	498.75	495.90	30.50	505.	500.75	32.15	+ 4.85
Wilson P Tests:							
3P (Add) Dec.6/32	93.57	92.60	5.35	95.	91.30	8.25	- 1.30
4P (Subt) " 7/32	94.	88.95	12.70	95.83	97.26	4.65	+ 8.31
5P (Mult) Jan.6/33	82.	80.45	10.70	91.47	89.55	7.	+ 9.10
6P1 (S.D.) " 9/33	85.50	80.	13.	96.80	95.90	3.75	+ 5.90
6P2 (L.D.) " 10/33	72.50	66.45	28.05	94.50	93.55	5.65	+27.10
Average	82.50	80.30	13.60	93.24	91.75	3.45	+11.45
Wilson Survey I: March 17, 1933							
Add. Section 1.	50.	48.80	3.40	50.	47.05	4.20	- 1.75
Subt. " 2.	48.33	47.05	6.25	50.	46.75	4.15	- .30
Mult. " 3.	40.	38.40	9.70	43.33	42.95	8.20	+ 4.55
Div. " 4.	44.17	42.65	9.05	45.	45.30	7.65	+ 2.65
Frac. " 5.	8.57	13.80	14.65	35.	34.55	13.50	+20.75
Bus. Know." 6.	33.	32.80	7.50	32.27	32.50	7.	- .30
Total Score	216.25	221.05	22.25	245.	246.45	22.65	+25.40
Wilson Survey II: May 19, 1933							
Add. Section 1.	50.	46.75	4.35	50.	46.60	4.35	- .15
Subt. " 2.	50.	47.05	6.	50.	47.05	4.	0.00
Mult. " 3.	40.56	42.50	8.15	41.66	41.45	8.20	- 1.05
Div. " 4.	47.	44.65	7.65	44.64	45.40	7.55	+ .75
Frac. " 5.	29.29	26.35	10.10	37.14	36.30	10.70	+ 9.95
Bus. Know." 6.	27.50	27.35	7.50	32.22	32.50	9.60	+ 5.51
Total Score	231.25	231.75	22.	250.83	247.20	22.55	+15.45
Composite I 1933 Mar16	95.	92.95	30.60	96.	95.75	4.35	+ 2.80
Composite II 1933 May17	95.91	94.10	7.70	96.56	94.25	3.25	+ .15
Composite III 1933 May18	97.14	96.20	5.55	96.79	96.90	3.75	+ .70
" Average	95.29	93.40	5.60	96.30	95.75	2.65	+ 2.35

Table 5. This table shows the Medians, Averages, and Standard Deviations for the paired groups of boys.

	EXPERIMENTAL BOYS			REGULAR PROGRAM BOYS			For
	Med.	Av.	S. D.	Med.	Av.	S. D.	Reg.
Age	11.15	11.38	1.09	11.03	11.36	1.26	- .02
Weighted Score	489.13	486.95	24.15	487.50	486.40	27.10	- .55
Wilson P Tests:							
3P (Add) Dec.6/32	94.38	91.20	8.50	94.72	93.80	3.95	+ 2.60
4P (Subt) " 7/32	91.50	87.30	14.65	93.61	89.90	6.70	+ 2.60
5P (Mult) Jan.6/33	85.32	78.60	14.55	87.92	88.25	9.05	+ 9.65
6P1 (S. D.) " 9/33	82.50	74.70	20.30	90.42	89.55	11.15	+ 4.85
6P2 (L. D.) " 10/33	81.25	68.05	28.05	90.17	86.55	14.70	+18.50
Average	78.50	78.25	15.10	90.83	89.35	7.70	+11.10
Wilson Survey I: March 17, 1933							
Add. Section 1.	50.	46.85	4.90	50.	47.20	4.65	+ .35
Subt. " 2.	50.	43.90	9.	49.50	46.75	6.70	+ 2.85
Mult. " 3.	41.25	37.70	12.25	40.94	38.60	7.75	+ .90
Div. " 4.	37.50	37.50	11.70	44.50	42.85	10.40	+ 5.35
Frac. " 5.	12.50	13.01	15.20	32.50	34.75	14.90	+21.74
Bus. Know." 6.	32.95	32.50	29.05	34.38	32.75	8.20	+ .25
Total Score	225.	216.85	31.50	243.50	235.80	33.70	+18.75
Wilson Survey II: May 19, 1933							
Add. Section 1.	50.	45.75	5.35	50.	46.85	3.85	+ 1.10
Subt. " 2.	49.06	46.40	8.65	50.	45.20	6.55	- 1.20
Mult. " 3.	38.25	37.31	9.15	36.50	36.40	8.50	- .91
Div. " 4.	42.92	41.75	10.30	43.75	42.10	9.55	+ .35
Frac. " 5.	22.50	21.80	13.55	29.17	26.55	14.25	+ 4.75
Bus. Know." 6.	28.75	27.87	11.20	30.50	30.70	6.10	+ 2.83
Total Score	222.50	217.30	32.05	224.17	227.30	28.15	+10.
Composite I 1933 Mar16	92.08	88.80	12.05	96.41	94.	7.25	+ 5.20
Composite II 1933 May17	93.13	89.70	11.65	93.25	91.	8.65	+ 1.30
Composite III 1933 May18	94.58	93.25	8.05	96.25	94.35	7.60	+ 1.10
" Average	93.50	92.02	9.25	94.72	92.45	6.55	+ .43

Table 4 shows for the paired groups of girls the Median, Average, and Standard Deviation for each group and in the last column the excess or deficiency in score of the regular girls on each of the items of the table. The number at the left of Table 4 running from 1 to 27 correspond to the numbers at the top of Table 2 and so admit of direct comparison. The last column of Table 4 shows for the regular girls based upon the average, the difference of score in terms of plus or minus.

Table 5 shows for the experimental and regular boys in similar manner, a comparison of the summary data from Table 3. The items of the table are numbered at the left from 1 to 27 corresponding with the numbers at the top of Table 3. The last column at the right of Table 5 shows for the regular boys, based upon the average, the comparative score in terms of plus or minus.

IV. ATTEMPT AT CORRECTION FOR SEPTEMBER DATA

Due to the fact that an inventory test had not been given immediately upon entrance to grade six because of the fact that the study had not yet been contemplated, it was found advisable to give the mid-year entering sixth grade an inventory test to see how much arithmetic they possessed, though they had received no formal training in arithmetic. Although these results cannot serve as a basis, nevertheless, they can serve as an indication of what is possible.

Immediately upon entering the sixth grade at mid-year promotion, January 1933, these pupils who had had no formal arithmetic were given the five Wilson Process Tests in order to see what would actually happen when they were faced with such a situation and to note what had been learned through incidental teaching or had been gained from outside information.

Table Z of the Appendix shows a summary of the results of administering the Wilson Process Tests, 3P, 4P, 5P, 6P1 and 6P2. These children have advanced through the first five grades of school without having been taught any formal arithmetic. Any results which the pupils have attained above zero is a decided gain.

Table 6 shows in summary form the data from Table Z. of the Appendix in terms of Median, Average, and Standard Deviation.

Table 6. The Mid-year Entering Sixth Grade Data from Table Z. is as follows:

		Median	Average	Stand. Dev.
Age		10.97	10.63	.95
Addition	3P	83.75	82.20	16.30
Subtraction	4P	41.66	47.65	30.
Multiplication	5P	20.	27.05	25.70
Short Div.	6P1	.42	17.65	19.50
Long Div.	6P2	0.00	0.00	0.00

The summary scores on the process tests of Table 6. are repeated in Table 7. and so arranged as to permit comparison of scores as of September for the Experimental Group. That is, the mid-year entering experimental sixth grade of January, while it is not paired up for individuals with the experimental group which carries the main story, may however, be taken as indicating approximately what our experimental groups would have done on the process tests had these tests been given them in September.

Table 7. Process Tests 3P, 4P, 5P, 6P1 and 6P2 for Mid-year Entering Class Sixth Grade Experimental Group and Sixth Grade Experimental Group. Boys and girls combined.

Averages for	Mid-year Entering Experimental Sixth Grade January 1933 From Table Z.	Sixth Grade Experimental since Sept. 1932 Tests given: Dec. 6/32 Dec. 7/32 Jan. 6/33 Jan, 9/33 Jan.10/33 Time: 3½ months. From Table X.	Gain
3P Add.	82.20	91.40	9.20
4P Subt.	47.65	84.82	37.17
5P Mult.	27.05	76.30	49.25
6P1 B. Div.	17.65	72.50	54.85
6P2 L. Div.	0.00	59.57	59.57

The above table is read beginning at the left as follows:

Column 1. The averages of the "P" (Process) Tests for the Mid-year Entering Experimental Sixth Grade of January 1933. The results have been taken from Table Z.

Column 2. The averages for the Experimental September 1932 Sixth Grade. The tests were given Dec. 6-7/32 and Jan. 6-9-10/33. A vacation interruption of two weeks left approximately three and a half months of formal training.

Column 3. The gain made in three and a half months by the Experimental Sixth Grade group since the beginning of school in September.

The surprising revelation of Table 7 is the large amount of gain made by the Experimental Group in the short period of three and a half months. It undoubtedly raises the question in very serious form as to whether or not the time previously devoted to arithmetic in the grades is justified.

Table 8. This table shows Surveys I and II for Experimental and Regular Program Girls .

	EXPERIMENTAL GIRLS			REGULAR PROGRAM GIRLS		
	1	2	3	1'	2'	3'
Surveys I and II	Survey I March 17/33 From Table 2	Survey II May 19/33 From Table 2	Gain 2 mos.	Survey I 3/17/33 Table 2	Survey II 5/19/33 Table 2	Gain 2 mos.
Add.	48.80	46.75	-2.05	47.05	46.60	- .35
Subt.	47.05	47.05	.0.00	46.75	47.05	+ .30
Mult.	38.40	42.50	+4.10	42.95	41.45	-1.50
Div.	42.65	44.65	+2.	45.30	45.40	+ .10
Frac.	13.80	26.35	+2.55	34.55	36.30	+1.75
Bus. Know.	32.80	27.35	-5.45	32.50	32.50	0.00
Total Score	221.05	231.75	+10.70	246.45	247.20	+ .75

Table 9. This table shows Surveys I and II for Experimental and Regular Program Boys.

	EXPERIMENTAL BOYS			REGULAR PROGRAM BOYS		
	1	2	3	1'	2'	3'
Surveys I and II	Survey I March 17/33 From Table 3	Survey II May 19/33 From Table 3	Gain 2 mos.	Survey I 3/17/33 Table 3	Survey II 5/19/33 Table 3	Gain 2 mos.
Add.	46.85	45.75	-1.10	47.20	46.85	- .35
Subt.	43.90	46.40	+2.50	46.75	45.20	-1.55
Mult.	37.70	37.31	- .39	38.60	36.40	- .20
Div.	37.50	41.75	+4.25	42.85	42.10	- .75
Frac.	13.01	21.80	+8.79	34.75	26.55	-8.20
Bus. Know.	32.50	27.87	-4.63	32.75	30.70	-2.05
Total Score	216.85	217.30	+ .45	235.80	227.30	-8.50

Table 8 shows that in the two months from the middle of march to the middle of May the Experimental Girls make a total gain of 10.70 out of a possible 300 on the Survey Tests while the Regulars about stand still the gain being less than one point. Even more surprising is the revelation from Table 9 that the Experimental Boys gain less than a point, namely .45 while on the other hand the Regular Boys lose 8.50.

The conclusions from Tables 8 and 9 are a little difficult. Apparently, although the Regulars have not reached proficiency, they are not showing proper advancement. The Experimental Boys with a gain of only .45 have also not shown the proper advancement. It is possible that there should be set up new standards and new procedures for the attainment of these standards.

Table 10. This table shows the results of the "P" (Process) Tests for both Experimental and Regular Program Girls. These figures have been taken from Table 2 and have been arranged to permit a comparison of the Experimental Girls with the Regular Program Girls.

		EXPERIMENTAL GIRLS	REGULAR GIRLS	
"P" Tests	Date	From Table 2.	From Table 2.	For Regulars
3P (Add)	Dec. 6/32	92.60	91.30	- 1.30
4P (Subt)	" 7/32	88.95	97.26	+ 8.31
5P (Mult)	Jan. 6/33	80.45	89.55	+ 9.10
6P1 (S.D.)	" 9/33	80.	95.90	+15.90
6P2 (L.D.)	" 10/33	66.45	93.55	+27.10

Table 10 shows that after approximately six years of formal training in arithmetic as compared to three and a half months for the Experimentals, the Regular Program Girls have only a greater advantage of:

8.31 for 4P (Subtraction)
9.10 " 5P (Multiplication)
15.90 " 6P1 (Short Division)
27.10 " 6P2 (Long Division)
A loss " 3P (Addition) of 1.30

Table 11. This table shows the results of the "P" (Process) Tests for both Experimental and Regular Program Boys. These figures have been taken from Table 3 and have been arranged to permit a comparison of the Experimental Boys with the Regular Program Boys.

(Table 11. continued)

"P" Tests	Date	EXPERIMENTAL BOYS From Table 3.	REGULAR BOYS From Table 3.	For Regulars
3P (Add)	Dec. 6/32	91.20	93.80	+ 2.60
4P (Subt)	" 7/32	87.30	89.90	+ 2.60
5P (Mult)	Jan. 6/33	78.60	88.25	+ 9.65
6P1 (S.D.)	" 9/33	74.70	89.55	+ 14.85
6P2 (L.D.)	" 10/33	68.05	86.55	+ 18.50

Table 11. shows that after approximately six years of formal training in arithmetic as compared to three and a half months for the Experimentals, the Regular Program Boys have only a greater advantage of:

2.60 for 3P (Addition)
2.60 " 4P (Subtraction)
9.65 " 5P (Multiplication)
14.85 " 6P1 (Short Division)
18.50 " 6P2 (Long Division)

From Tables 10 and 11, we may conclude that the lead or advantage held by the Regular Program Boys, as well as Regular Program Girls, does not seem sufficient to warrant the great expenditure of time devoted to formal arithmetic. It raises the question as to whether or not the returns are commensurate with the time invested. Comparing Tables 10 and 11, we find that with the exception of addition and multiplication the Regular Program Girls hold a greater advantage over the Regular Program Boys.

(Table 12. continued)

Date	From Table 3.	For Regulars
Dec. 6/25	81.30	86.30 + 5.00
" 7/25	87.50	88.90 + 1.40
Jan. 8/26	76.80	86.80 + 9.80
" 6/26	74.70	89.55 + 14.85
" 10/26	82.05	86.55 + 13.50

Table 12. This table shows the results of Composite Tests I, II, and III for the Experimental and Regular Program Girls. It also shows gain or loss over each preceding test.

Results have been taken from Table 2.
Composite signifies all five processes combined.

	Comp.I March 16/33 Tab.2	Comp.II May 17/33 Tab.2	Gain	Comp.III May 18/33 Tab.2	Gain III over II	Gain III over I
EXPERIMENTAL GIRLS	92.95	94.10	+1.15	96.20	+2.10	+ 3.25
REGULAR PROGRAM GIRLS	95.75	94.25	-1.50	96.90	+2.65	+ 1.15

Table 12 shows straight gains on the part of the Experimental Girls and a loss on the part of the Regular Program Girls; For the Experimental Girls, a gain of 1.15 on Comp. II over Comp. I, a gain of 2.10 on Comp. III over Comp. II, and 3.25 on Comp. III over Comp. I. For the Regular Program Girls, a loss of 1.50 on Comp. II over Comp. I, a gain of 2.65 on Comp. III over Comp. II, and a gain of 1.15 on Comp. III over Comp. I.

At the conclusion of one school year which included the learning of the tables and all five processes, we find the Experimental Girls attaining an average on the Composite Tests as high as 96.20 as compared to 96.90 for the Regular Program Girls and a gain of 3.25 over the first composite test taken as compared with 1.15 for the Regular Program Girls. It seems fair to conclude that the Regular Girls are pivoting around the same point.

Table 13. This table shows the results of Composite Tests I, II, and III for the Experimental and Regular Program Boys. It is treated in similar manner as Table 12 and shows gain or loss over each preceding test.
Results have been taken from Table 3.
Composite, as has been stated, signifies all five processes combined.

	Comp.I March 16/33 Tab.3	Comp.II May 17/33 Tab.3	Gain	Comp.III May 18/33 Tab.3	Gain III over II	Gain III over I
EXPERIMENTAL BOYS	88.80	89.70	+.90	93.25	+3.55	+4.45
REGULAR PROGRAM BOYS	94.	91.	-3.00	94.35	+3.35	+ .35

Table 13 shows straight gains on the part of the Experimental Boys and a loss on the part of the Regular Program Boys: For the Experimental Boys, a gain of .90 on Comp. II over Comp. I, a gain of 3.55 on Comp.III over Comp. II, and a gain of 4.45 on Comp. III over Comp. I. For the Regular Program Boys, a loss of 3 points on Comp. II over I, a gain of 3.35 on Comp. III over II, and a gain of .35 on Comp. III over Comp. I.

At the conclusion of one school year which included the learning of the tables and all five processes, we find the Experimental Boys attaining an average on the Composite Tests as high as 93.25 as compared to 94.35 for the Regular Program Boys and a gain of 4.45 over the first composite test taken as compared with .35 for the Regular Program Boys. The Regular Program Boys with only an advance of .35 shows that they, like the Regular Program Girls are pivoting around the same point. This would tend to indicate a great waste in the present method of teaching formal arithmetic.

CONCLUSIONS

In summarizing the data obtained in this arithmetic study the following conclusions may be stated:

1. Addition and subtraction are the two processes most common in the life of the child and their acquirement takes place to a considerable extent through incidental teaching of the schoolroom and information learned outside. Table 6 shows the attainment of 82.20 in addition and 47.65 in subtraction at the time of entering the sixth grade, having had no formal arithmetic in school.
2. Children below the sixth grade learn little in multiplication, short division, long division, and fractions. See Table 6. Also Tables 4 and 5.
3. Sixth grade children can be brought up to level of traditional teaching very rapidly. In 3½ months, addition can be brought up to 91.40 which is only 1.67 below those who have had formal training for five years previous to entering the sixth grade. Subtraction, multiplication, short division, and long division show far greater possibilities; for example, a gain of 37.17 in subtraction, 49.25 in multiplication, 54.85 in short division, and a gain of 59.57 in long division in three and a half months. The more difficult the process, the greater has been the gain. See Table 6. Also Table X in the appendix.
4. Pupils who <u>have not</u> had formal arithmetic over an extended length of time show greater gains. See Tables 8, 9, 12, and 13.

5. Individual differences are as pronounced in arithmetic as they are in the attainment of mental scores.
   See Tables X and Y of the Appendix. Also Table Z.
6. A study of the data indicates that more attention should be given to individual differences.
   See Tables X and Y of the Appendix. Also Table Z.
7. Experimental girls, as well as boys, have attained ranks equal to or greater than those who have followed the regular program.
   See Tables 8, 9, 12, and 13.
8. The results of this study cast doubt upon whether we are justified in devoting five years to the drilling of formal arithmetic.
   See Tables 6 and 7 for the gain in $3\frac{1}{2}$ months.
   The difference in scores on Surveys I and II shows how much progress can be made in 2 months. See Tables 8 and 9.
   Out of a possible score of 300, the Experimental Girls attain a rank of 221.05 on Survey I and 231.75 on Survey II, a gain of 10.70 in 2 months. In comparison, the Regular Program Girls secure a score of 246.45 on Survey I and 247.20 on Survey II, a gain of .75
   The Experimental Boys attain a rank of 216.85 on Survey I and 217.30 on Survey II as compared to 235.80 for the Regular Program Boys on Survey I and 227.30 on Survey II. Thus the Experimental Boys gain less than a point but the Regular Program Boys lose 8.50. See Tables 8 and 9.
9. In formal arithmetic there is a decided tendency to pivot around the same point. See Tables 12 and 13.
   On the Composite Tests the Experimental Girls attain scores

of 92.95, 94.10, and 96.20 which show straight gains as compared to 95.75, 94.25, and 96.90 which shows a drop. The Experimental Boys attain scores of 88.80, 89.70, and 93.25 as compared to 94, 91, and 94.35. The Experimental Boys show straight gains while the Regular Program Boys are still at 94. See Tables 12 and 13.

The writer recognizes the limitations of the study. There are only 61 matched pairs. The study is limited to a single city. The effort has been made to spread the data fairly thus permitting others to have bases for conclusions.

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APPENDIX

SUPT. BENEZET'S REASON FOR THE EXPERIMENT:

An interview with Mr. Benezet regarding his deferred formal arithmetic plan brought forth the following introductory remarks: "We have been chloroforming children's reasoning powers. We have been drilling them in formulae and tables to the detriment of their reasoning ability" Mr. Benezet elaborated by saying that subjects should be taught which are near to the child's interests and more in touch with his daily life. He maintains that much more vital and valuable material should be placed within the pupils reach. He is staunch in his belief that childrens' minds should be stored with interesting material instead of being cluttered with uninteresting matter and advocates only those materials and methods which make for mental expansion. Mr. Benezet's objective is to get children to reason. He maintains that children should read all they possibly can and then be able to discuss intelligently what they have read. Mr. Benezet says, "The greatest drawback in America to educational progress is that the best minds in many cases are not worked to capacity."[1] It is his conviction that formal arithmetic drilled before the child's reasoning powers are developed is one of the underlying causes for stunted reasoning powers. It is also his contention that much valuable time is being lost because of persistence in clinging to traditional methods for no better reason than the fact that it has always been done that way in the past. He maintains that due to this traditional attitude, pupils do

1. Annual Report of the School Committee
Manchester, N. H. 1930 P.6

not get enough live material nor proper incentives and therefore drift through school without very much effort because it is so easy for them to surpass their mediocre comrades.

Mr. Benezet feels that greater intellectual powers can be secured by warding off material which makes for mental stunting and substituting in its place content in which the children find enjoyment, as well as things common to their understanding, experience, and environment. This is his reason for deferring formal arithmetic to a later grade.

The experiment of deferring formal arithmetic to Grade six was prompted by Mr. Benezet's arithmetic survey in his schools, which forcefully brought to his attention the fact that there was a decided need for a change in the curriculum. He learned many revealing facts regarding the failure of children to apply what they had learned. "The result of this inquiry was that more pressure was put upon teachers in the middle grades to get the children to express themselves, to talk English, to guess, to estimate, to reason. In four rooms, with the permission of the parents, an experiment was tried. Teachers were told to soft-pedal the mechanical arithmetical drills and to concentrate on reasoning, estimating, and on self-expression. They were asked to give the children a great number of books to read, and to encourage oral English in telling the story of these various books. They were supplied with books on Elementary Science, with readers dealing with health habits, with books on good citizenship, supplementary readers in Geography and History, etc." [1.]

1. Annual Report of the School Committee, Manchester, N. H. 1930 P.21

"The results were astonishing as far as the developing of fluency in English was concerned. Toward the end of the school year, the superintendent, with his secretary, visited rooms of a certain grade throughout the city and compared the ability to express themselves of children who had followed the traditional course of study with that of those who had had this special training. It was surprising to note the difference. In one room taught under the traditional method, not a single child could be induced to stand up and tell the story of any book or anecdote that he had read; while in the experimental rooms children vied with each other for the privilege of reciting. Next the superintendent tested some of these same rooms on their ability to reason arithmetical problems, and found to his great pleasure that the children solved problems in an intelligent manner unknown to those who had merely been taught the mechanical processes and the routine of drill."[1.] In concluding his discussion Mr. Benezet says, "The superintendent will be the first to admit it if the verdict of the upper grade teachers who receive these pupils is that they are not well fitted to go on as those who have been brought up on the traditional curriculum." In his words are disclosed his courageous attitude to face facts while seeking to eliminate educational stagnation. The following, also, is expressive of Mr. Benezet: "The stream of life is moving around us, and if we throw down an anchor with the avowed purpose of remaining stationary, we soon find ourselves hopelessly behind the onward rush of progress."[1.]

1. Annual Report of the School Committee
Manchester, N. H. 1930. P5 and P.21

Some teachers, new in the experiment, have steered clear of all arithmetic but Mr. Benezet's idea is really to teach any arithmetic as the need comes up but not on the plane of formal drill. It is therefore evident that some of the teachers are also adjusting themselves in the experiment. If any gains are in evidence now, they should prove far greater at a later date when the teachers are more experienced in this new manner of teaching arithmetic. It must be remembered, also, that a teacher's attitude is also a determining factor in the high attainment of any experiment.

A DEMONSTRATION LESSON

VERSUS

SUPT. BENEZET'S BELIEFS AND FINDINGS

The writer learned that Supt. Benezet was to conduct a DEMONSTRATION LESSON at the School Administration Building for the Sixth Grade teachers of the city (Manchester, New Hampshire) with one of the EXPERIMENTAL groups as his class (Lincoln School) and, therefore, asked for the privilege of being present. The request was granted and it proved, indeed, a pleasure and a privilege to witness superior teaching by a superior teacher, for Mr. Benezet meets the children on their own ground and then through a gradual development brings them, as quickly as possible, to higher levels of thinking.

The lesson was based on WAR DEBTS and Mr. Benezet began by asking the children to recall what he had told them in their classroom at a previous meeting. This previous lesson had evidently dealt with foreign countries for in response to Mr. Benezet's questions, he received certain definite information from them pertaining to the administrative offices of our own Nation, City, and State but with the emphasis on the Nation and the President's Cabinet. In relation to the War Department as well as from the recognition of vast amounts of money owed the United States on foreign debts, Mr. Benezet, by means of a pie diagram which he drew on the board, led the children to a comparison of the amount of money spent for education and battleships and this in turn brought them to an appreciation of the extravagances and destructions of war. The type of thinking the children were doing is exemplified by one youngster's opinion that

the United States needs a Peace as well as War Department in its Cabinet.

True, to Mr. Benezet's statements, quoted at the very outset of this study, the children were on their feet every chance they could possibly get to tell all they knew. They were free to think and, indeed, made the most of every opportunity. One could see mental expansion in actual operation, and also observe satisfactions register, when accredited with right answers or worthwhile opinions for every second brought something to challenge their interests, and which they had to reach high to get. The teachers present saw no parasites but rather children who were taking a delight in independent intelligent thinking. These children were very much alive and there was not a single instance of a child being self-conscious or wishing to be over-looked. These children were free and unhampered by formal procedure and were finding themselves a part of the great world and scheme of things in which their knowledge and opinions mingled with those of older folks. They were transmitting and acquiring knowledge, and by means of directed guessing, when in doubt, were developing judgment. These children of a sixth grade were, indeed, laying the foundation for worthwhile thinking and judgment which is so essential to intelligent citizenship. These active and thinking individuals not only transmitted and received knowledge but also lived and felt the things they talked about because they were being brought up on Mr. Benezet's formulae for "INTELLECTUAL CURIOSITY".

Mr. Benezet summarized his demonstration lesson by saying that the teachers had witnessed a fair sample of the way he found children reacting under his experimental program. He asked the

teachers to be ready to suggest what they would like to have in an ideal curriculum. He asked them to omit past prejudices, stereotyped convictions, and to think only of the children and what they should be learning. The following was his declaration: "I am willing to scrap the whole old fashioned curriculum." He stated that he wanted the children: 1. To read. 2. To get up and recite. 3. To reason, and to guess if necessary. 4. To have intellectual curiosity. He also stated that he wanted the children to acquire ability to gain thought from the printed page and to be able to translate what they have read into good English, also, to create a desire to go and look things up, for next to knowing Mr. Benezet believes, is--knowing where to find it. Mr. Benezet stated that the tyranny of the dead is still strong in education and that we must overcome this and approach education from an entirely new viewpoint.

The writer appreciated the opportunity of being present during the lesson for it allowed a check-up of any possible gains outside the formal arithmetic tests.

Boston University
School of Education
Library

INFORMATION BLANK

(In order to secure information regarding the children, the following data was called for.)

TO THE PRINCIPAL AND TEACHER GIVING ARITHMETIC TESTS:

Will you please ask the pupils to write out the data called for below and hand in these papers together with your estimate of their rating in class? Will you give this approximate rating in figures?

This material is to be put in the same envelope with the addition and subtraction tests and left at Mr. Benezet's office.

Pupil's name

School

Grade

Father's work---(If not working at the present time, tell what he did before he stopped.)

Mother's work---(If she takes care of the home, say so. If she goes out to work in the mill, shoe shop, or the like, you may say so.) (This is to be voluntary on the part of the children.)

Date of birth: Year-month-day

Pupil's age when school began this September.

Grade history: (Extra promotions; six years for six grades; or has any grade or grades been repeated. Full particulars.)

Arithmetic history: (How much arithmetic previous to present grade?)

For the teacher: When pupil passes in his paper to you, will you make a note of his approximate class rating in figures? Add any information you wish.

INSTRUCTIONS FOR READING TABLES X AND Y. EXPERIMENTAL AND REGULAR GROUPS.

Tables X and Y are read beginning at the left as follows:

Column	1.	Pupil's school and number.	
"	2.	Pupil's age.	
"	3.	Grade history. The number of years in school.	
"	4.	Teacher's estimate of the pupil's general class rating.	
"	5.	Kuhlman-Anderson mental score.	Jan. 11/33
"	6.	Haggerty Delta 2 mental score.	Jan. 12/33
"	7.	Arithmetic history. The amount of formal arithmetic.	
"	8.	Results of Wilson 3P Test. (Addition)	Dec. 6/32
"	9.	" " " 4P " (Subtraction)	" 7/32
"	10.	" " " 5P " (Multiplication)	Jan. 6/33
"	11.	" " " 6P1." (Short Division)	" 9/33
"	12.	" " " 6P2." (Long Division)	" 10/33
"	13.	Average of all Wilson "P" (Process) Tests.	
"	14.	Results of Composite Test I.	March 16/33
"	15.	" " " " II.	May 17/33
"	16.	" " " " III.	May 18/33
"	17.	Average of all Composite Tests.	
"	18.	(Addition on the Wilson General Survey Form I Test.	March 17/33
"	19.	(Subtraction " " " " " "	"
"	20.	(Multiplication " " " " " "	"
"	21.	(Division " " " " " "	"
"	22.	(Fractions " " " " " "	"
"	23.	(Business Arithmetic " " " " "	"
"	24.	(Total Score on Wilson " " " " "	"
"	25.	Addition on the Wilson General Survey Form II Test.	May 19/33
"	26.	Subtraction " " " " " "	"
"	27.	Multiplication" " " " " "	"
"	28.	Division " " " " " "	"
"	29.	Fractions " " " " " "	"
"	30.	Business Arithmetic" " " " "	"
"	31.	Total Score on " " " " "	"

82 pupils

Table X — Experimental Group.

(Instructions for reading precedes this table.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Name	Age	Teacher's Rating of Pupil	Intelligence Scores Jan. 11, 1933 Kuhlmann-Anderson Grade II	Jan. 13, 1933 Haggerty Delta 2.	Arithmetic History (yrs.)	Wilson Inventory + Diag Tests Dec. 6/32 3P Add.	Dec. 7/32 4P Subt.	Jan. 6/33 5P Mult.	Jan. 9/33 6P1. S. Div.	Jan. 10/33 6P2. L. Div.	Average for Wilson Inv. Tests	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average for Composite Tests	Wilson General Survey Test Form I March 17, 1933 Survey I Add.	Subt.	Mult.	Div.	Frac.	Business Arith	Total Score for Survey Form I	Wilson General Survey Test Form II May 19, 1933 Survey II Add.	Subt.	Mult.	Div.	Frac.	Business Arith.	Total Score for Survey Form II
1 B1	10-11	90	85	107	0	98	100	93	96	94	96.20	98	100	98	98.67	50	42	30	50	2	30	204 about incomplete	50	50	35	50	24	26	235
2 B2	11-3	65	70	63	0	78	63	50	62	28	56.20	64	82	84	76.67	50	50	21	23	—	43	incomplete	46	40	37	29	0	20	172
3 B3	10-6	90	83	113	0	94	99	85	97	84	91.60	100	96	92	96.	50	50	37	50	46	25	258	50	45	48	50	29	36	258
4 B4	12-0	85	51	97	0	96	99	92	89	90	93.20	94	88	100	94.	50	50	50	42	15	39	246	44	40	43	50	10	32	219
5 B5	11-2	80	64	45	0	96	98	91	90	80	91.	100	100	100	100	50	50	50	32	6	39	227	50	50	46	36	26	17	225
6 B6	10-10	85	64	74	0	98	98	90	94	90	94.	86	96	100	94.	50	50	30	50	10	40	230	50	50	40	42	29	16	227
7 B7	11-1	90	79	83	0	98	100	94	100	96	97.60	100	96	100	98.67	50	46	50	50	14	35	245	50	50	49	50	34	38	271
8 B8	15-4	35	13	18	0	67	52	35	37	54	49.	38	34	46	39.34	32	19	18	20	—	—	about incomplete	44	17	14	20	0	32	127
9 B9	13-10	60	29	42	0	83	56	49	38	22	49.60	56	48	56	53.34	50	16	37	21	—	15	about incomp.	39	12	15	19	0	10	95
10 B10	11-2	85	68	67	0	92	100	89	93	92	93.20	96	98	96	96.67	46	50	40	34	10	30	210	50	50	37	50	21	38	246
11 B11	11-3	75	63	76	0	84	83	61	72	52	70.40	84	72	82	79.34	43	43	19	21	2	29	157	49	36	19	22	4	31	161
12 B12	12-1	75	42	47	0	88	43	41	29	4	41.	58	70	P2	70.	47	35	16	24	6	14	142	49	32	18	22	4	30	155
13 B13	10-10	75	62	73	0	95	98	85	89	92	91.40	92	96	98	95.34	50	42	43	50	16	32	233	38	50	25	42	23	26	204
14 B14	11-2	60	70	76	0	84	93	64	60	16	63.40	90	90	92	90.67	41	46	23	21	—	25	about incomp.	39	45	38	42	0	33	197
15 B15	13-4	60	46	48	0	56	73	43	34	36	48.40	40	52	62	51.34	34	28	9	12	—	14	about incomp.	49	38	11	16	0	10	124
16 B16	10-3	90	82	112	0	96	94	90	92	98	94.	98	98	98	98.	50	50	30	50	28	37	245	41	50	40	42	27	28	228
17 B17	10-5	80	69	83	0	86	86	68	63	88	78.20	74	88	96	86.	47	46	21	29	20	32	195	38	40	38	37	22	12	187
18 B18	11-4	95	74	84	0	98	100	87	98	94	95.40	100	100	98	99.34	50	50	27	45	18	31	221	50	45	37	50	32	30	244
19 B19	11-3	80	73	84	0	88	99	85	86	86	88.80	90	100	90	93.34	50	38	27	45	9	31	200	50	45	50	50	34	40	269
20 B20	13-4	83	66	56	0	92	96	96	86	84	90.80	88	94	92	91.34	41	47	30	42	7	30	197	48	50	30	42	8	36	214
21 B21	12-2	83	57	78	0	91	99	81	59	74	80.80	84	96	98	92.67	50	37	50	34	10	38	219	50	50	30	50	24	26	230
22 B22	13-4	83	58	64	0	95	95	90	86	90	91.20	96	100	98	98.	50	50	50	42	6	31	229	50	50	50	42	28	28	248
23 B23	11-4	80	72	91	0	89	83	77	60	42	70.20	78	78	88	81.34	38	50	25	22	6	25	166	50	45	24	29	2	36	186
24 B24	12-7	70	61	77	0	91	84	74	48	80	75.40	84	88	84	88.67	43	23	23	24	2	32	147	48	15	24	28	9	36	160
25 B25	11-3	70	53	55	0	87	47	61	63	48	71.20	72	70	80	74.	47	50	23	18	9	32	179	37	50	33	31	0	20	171
26 B26	11-6	80	67	60	0	88	76	60	67	34	65.	82	68	78	76.	47	45	27	28	4	32	183	47	47	31	21	6	37	189
27 B27	10-5	90	84	108	0	90	98	84	89	90	90.20	100	94	86	93.34	50	46	46	50	13	50	255	48	46	31	42	32	38	237
28 B28	10-11	80	46	54	0	91	97	84	84	76	86.40	90	96	98	94.67	50	34	44	34	4	33	199	42	50	38	34	30	35	229
29 B29	10-9	85	66	106	0	72	33	51	73	12	48.20	58	62	70	63.34	38	17	4	19	—	17	about incomp.	38	20	23	24	0	36	141
30 B30	11-6	65	61	56	0	94	90	76	79	16	71.	86	92	98	92.	50	50	32	23	9	42	206	41	35	35	34	6	26	177
31 B31	11-8	70	48	55	0	87	85	63	83	72	78.	86	84	98	89.	50	42	40	29	3	31	195	46	46	40	34	34	32	232
32 B32	11-1	40	31	58	0	72	61	45	15	6	39.80	52	68	70	63.34	50	42	21	14	—	26	about incomp.	41	45	37	31	0	22	176
33 L1	12-7	68	54	94	0	96	88	74	30	60	69.60	88	72	88	82.67	50	50	38	50	50	38	191	50	46	24	25	36	42	223
34 L2	11-4	68	60	92	0	94	66	61	26	66	62.60	86	86	90	87.34	50	46	29	24	0	26	175	39	50	40	49	31	42	251
35 L3	13-8	65	46	68	0	97	72	84	42	26	64.20	72	74	82	76.	42	35	26	17	0	0	120	46	34	47	23	6	5	161
36 L4	10-7	63	68	75	0	90	87	51	32	2	52.20	68	Not promoted																
37 L5	10-11	70	73	103	0	79	91	63	42	16	58.20	74	88	82	81.34	45	47	27	24	6	33	182	50	50	36	29	30	5	200
38 L6	11-6	71	62	75	0	89	84	60	53	58	68.80	84	90	96	90.	50	46	26	41	10	39	212	50	50	25	49	28	22	224
39 L7	10-7	69	76	97	0	85	69	84	35	12	57.	66	86	90	80.67	49	43	23	31	20	30	196	43	45	20	37	34	19	198
40 L8	11-1	75	57	72	2	97	42	93	88	88	81.60	96	92	92	93.34	50	50	50	34	0	34	218	47	50	47	42	6	21	213
41 L9	11-8	83	75	101	0	92	75	82	73	66	77.60	Transferred																	
42 L10	12-4	78	72	70	0	92	80	77	78	66	78.60	92	76	92	86.67	50	42	27	50	17	35	221	49	36	32	45	39	15	216
43 L11	11-2	58	64	92	0	95	73	79	36	38	64.20	92	94	90	92	50	46	46	34	10	22	208	49	50	40	50	27	33	249
44 L12	10-7	89	72	78	0	91	98	88	71	72	84.	88	90	90	89.34	50	46	40	24	12	21	193	50	50	48	44	30	36.	258
45 L13	12-3	60	52	68	0	96	99	84	69	90	87.60	92	Transferred																
46 L14	10-10	83	77	94	0	93	96	86	75	80	86.	88	54	88	76.67	50	50	40	26	36	27	229	46	45	35	34	39	40	239

(Table X Continued. Experimental Group. (Instructions for reading precedes table)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Name	Age	Teacher's Rating of Pupil.	Intelligence Scores Jan. 11, 1933 Kuhlman-Anderson Grade VI	Jan. 12, 1933 Haggerty Delta 2.	Arithmetic History (yrs.)	Wilson Inventory & Diag. Tests Dec. 6/32 3P Add.	Dec. 7/32 4P Subt.	Jan. 6/33 5P Mult.	Jan. 9/33 6P1. S.Div.	Jan. 10/33 6P2. L.Div.	Average for Wilson Inv. Tests	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average for Composite Tests	Wilson General Survey Test Form I March 17, 1933 Survey I Add.	Subt.	Mult.	Div.	Frac.	Business Arith.	Total Score for Survey Form I	Wilson General Survey Test Form II May 19, 1933 Survey II Add.	Subt.	Mult.	Div.	Frac.	Business Arith.	Total Score for Survey Form II
47 L15	10-6	82	72	104	0	98	97	90	98	98	96.20	94	100	92	95.34	42	47	47	33	24	37	230	41	50	40	50	50	41	272
48 L16	10-8	57	53	74	0	83	68	60	39	16	53.20	70	76	84	76.67	47	46	24	14	4	39	174	-	-	-	-	-	-	-
49 L17	13-0	84	69	81	2	84	92	77	57	82	78.40	88	88	84	84.	50	46	47	34	6	31	214	48	50	36	42	13	12	201
50 L18	8-8	71	65	65	1	98	85	75	33	34	65.	94	94	90	92.67	50	47	40	32	4	27	200	50	46	29	50	32	16	223
51 H1	10-5	70	61	48	2	100	98	88	75	62	84.60	84	78	84	82.	47	35	30	23	32	20	187	47	29	22	39	37	10	184
52 H2	10-5	70	-	-	2	92	70	72	75	0	63.80	Hospital - ill - - -				-	-	-	-	-	-	-	-	-	-	-	-	-	-
53 H3	10-9	80	96	101	1	100	91	85	89	70	87.	76	62	78	72.	50	39	34	33	38	40	234	50	36	29	27	7	20	169
54 H4	11-1	85	82	75	1	100	100	90	89	80	91.80	90	92	84	88.67	50	43	24	50	45	30	242	50	50	46	32	34	20	232
55 H5	11-7	74	58	88	1	95	72	84	82	66	79.80	82	70	86	79.34	50	20	24	32	45	20	191	50	23	39	35	35	20	202
56 H6	10-10	85	88	106	6	98	100	96	100	96	98.	98	90	100	96.	50	50	50	40	21	47	258	50	49	30	42	34	40	245
57 H7	10-5	73	70	88	6	95	91	79	67	66	79.60	84	88	74	82.	37	46	26	33	35	20	197	38	44	23	29	32	20	186
58 H8	11-0	80	76	105	1	96	100	81	78	68	84.60	90	80	84	84.67	50	43	25	34	44	20	216	40	45	40	33	42	20	220
59 H9	12-8	70	35	61	3	96	74	73	60	16	63.80	64	30	46	46.67	50	31	26	23	23	30	183	50	29	7	26	0	20	132
60 H10	12-5	70	43	59	1	96	85	67	71	58	75.40	68	68	72	69.34	43	27	19	19	10	20	138	50	49	23	33	23	30	208
61 H11	10-9	80	81	110	6	90	92	87	89	80	87.60	78	78	82	79.34	39	39	46	34	34	30	222	49	40	14	37	5	40	185
62 H12	11-2	90	93	96	1	100	100	93	95	98	97.34	90	100	98	96.	50	46	40	50	46	40	272	50	50	43	45	14	10	212
63 H13	10-10	90	86	89	1	100	100	97	98	98	98.60	100	96	94	96.67	50	50	36	50	48	20	254	50	50	40	45	50	10	245
64 H14	10-10	75	85	104	1	100	100	95	93	86	94.80	88	98	94	93.34	50	42	40	50	34	20	236	50	45	34	50	11	20	210
65 Y1	11-1	88	73	96	0	88	73	43	80	58	68.40	98	100	100	99.34	50	50	48	42	6	37	233	48	50	35	42	16	16	207
66 Y2	12-6	90	58	86	0	95	94	80	86	70	85.	94	100	100	98.	50	50	40	42	4	27	213	47	50	50	50	37	31	265
67 Y3	10-4	90	60	112	0	70	68	73	44	10	53.	92	90	100	94.	50	43	50	48	6	50	247	50	50	47	50	28	24	249
68 Y4	12-1	90	84	79	½	93	95	67	86	97	87.60	96	96	98	96.67	41	46	50	50	0	31	218	50	50	37	50	15	16	218
69 Y5	10-11	90	73	101	0	76	99	86	88	10	71.80	98	96	98	97.34	50	50	47	50	0	37	234	50	50	40	42	15	22	219
70 Y6	12-4	88	72	64	0	80	89	79	89	74	82.20	96	96	100	97.34	50	46	40	42	10	19	207	50	50	50	50	32	17	249
71 Y7	12-6	90	68	95	0	99	97	56	95	58	81.	98	100	100	99.34	50	50	47	50	7	33	237	50	50	50	50	39	22	261
72 Y8	11-1	90	57	82	0	98	81	89	56	6	66.	100	98	100	99.34	50	50	50	50	4	23	227	50	50	50	50	13	34	247
73 Y9	11-4	90	77	82	0	92	82	80	86	10	70.	96	94	96	95.34	50	47	30	42	0	47	216	44	46	27	50	21	30	218
74 Y10	10-10	85	75	87	0	92	63	73	85	48	72.20	100	98	98	98.67	50	46	30	33	7	35	201	50	50	48	50	16	26	240
75 Y11	11-4	90	67	72	½	95	83	84	85	50	79.40	98	98	98	98	50	50	40	50	0	32	222	50	50	42	41	24	24	231
76 Y12	11-5	90	79	84	½	88	82	67	92	66	79.	98	94	98	96.67	50	50	30	35	2	31	198	50	45	39	50	20	22	226
77 Y13	10-8	90	77	76	0	81	94	65	82	77	79.80	98	100	100	99.34	50	50	40	50	0	39	229	50	50	43	50	16	28	267
78 Y14	10-10	90	88	80	0	90	96	83	91	90	90	96	100	100	98.67	50	50	50	50	4	18	222	50	45	37	45	39	26	242
79 Y15	11-1	85	79	89	0	94	64	59	72	8	59.40	100	100	100	100	50	50	50	50	7	27	234	50	50	36	42	33	14	225
80 Y16	10-11	90	87	91	0	92	64	82	83	48	73.80	96	98	100	98	50	50	40	34	0	24	198	50	50	34	50	16	33	233
81 Y17	11-1	90	72	73	½	95	91	63	74	14	67.40	96	96	100	97.34	50	50	40	45	13	47	245	50	50	40	50	29	20	239
82 Y18	11-2	90	60	87	0	96	92	94	82	90	90.80	98	94	98	96.67	50	47	30	50	0	31	208	48	50	50	50	25	30	253
Median	11.21	82.50	69.75	80.83	.34	93.41	90.38	80.36	79.17	67.86	77.91	91.	92.14	94	92.14	50	47.84	34.77	34.26	9.67	31.88	213.75	50	49.88	37.64	42.50	24.72	26.39	220.63	Median
Av.	11.46	80.20	66.88	80.40	.77	91.40	84.82	76.30	72.50	59.57	76.46	85.56	86.96	92.58	87.44	47.09	45.16	35.60	36.55	14.86	31.28	211.10	45.84	46.20	36.01	40.81	22.50	26.18	213.55	Average
S.D.	1.72	11.65	14.75	19.10	1.21	6.70	16.60	14.75	22.05	30.65	15.10	14.25	15.65	12.	13.10	5.10	9.	11.70	12.65	14.15	8.75	29.50	5.85	9.50	10.70	10.60	12.20	9.25	37.05	Standard Deviation

106 pupils.

Table V. Regular Program Group.

(Instructions for reading this table precedes Table X.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Name	Age	Teacher's Rating of Pupil.	Intelligence Scores Jan. 11, 1933 Kuhlman-Anderson Grade VI	Jan. 12, 1933 Hafferty Delta 2.	Arithmetic History (Yrs.)	Wilson Inventory & Diag Tests Dec. 6/32 3P Add.	Dec. 7/32 4P Subt.	Jan. 6/33 5P Mult.	Jan. 9/33 6P1. S.Div.	Jan. 10/33 6P2. L.Div.	Average for Wilson Inv. Tests	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average for Composite Tests	Wilson General Survey Test Form I March 17, 1933 Survey I Add.	Subt.	Mult.	Div.	Frac.	Business Arith	Total Score for Survey Form I	Wilson General Survey Test Form II May 19, 1933 Survey II Add.	Subt.	Mult.	Div.	Frac.	Business Arith	Total Score for Survey Form II
* H1	10-9	95	89	118	5	97	90	83	98	98	93.20	96	92	100	96	50	38	30	48	44	39	249	50	45	26	50	38	40	249
* H2	11-5	95	76	97	5	98	99	96	98	98	97.80	Moved out of town -																	
3 H3	13-1	70	74	93	4	90	83	95	96	88	90.40	96	94	92	94	41	43	40	50	38	22	234	50	47	35	50	46	27	255
4 H4	12-11	65	84	90	6	95	96	81	91	90	90.60	92	88	90	90	50	46	26	32	33	15	202	50	46	36	29	28	20	209
5 H5	12-6	70	75	82	5	97	94	97	96	92	95.20	96	94	100	96.67	50	50	40	50	29	43	262	50	50	47	42	12	25	226
6 H6	11-10	80	80	80	5½	95	93	88	94	90	92	98	90	92	93.34	50	49	40	50	43	40	272	50	35	27	34	37	38	221
7 H7	11-10	30	76	102	6	96	86	90	89	78	87.80	Not promoted - - -																	
8 H8	10-4	90	99	105	5	94	97	92	95	94	94.40	98	92	96	95.34	41	45	40	42	50	32	250	41	50	47	50	48	32	268
9 H9	10-5	70	72	66	5	73	90	84	93	90	86.	92	90	94	92	50	46	30	50	50	21	247	33	50	33	50	40	25	231
10 H10	11-5	75	-	-	4	90	93	81	80	86	86.	88	62	86	78.67	47	46	36	42	45	36	252	50	41	27	28	31	13	190
11 H11	11-9	85	85	104	6	96	98	88	94	98	94.80	98	100	100	99.34	50	50	40	34	34	42	250	46	40	35	42	12	40	215
12 H12	10-11	50	72	72	5	97	95	92	100	96	96	98	98	100	98.67	50	50	50	42	47	22	261	50	50	40	40	47	20	247
13 H13	11-1	95	96	89	5	96	95	98	98	92	95.80	98	98	98	98	50	50	50	50	48	36	284	50	50	40	42	44	25	251
14 H14	11-3	30	71	75	6	95	96	88	97	86	92.40	Not promoted - - -																	
15 H15	11-7	90	77	85	5½	97	97	92	88	100	94.80	98	92	100	96.67	50	50	47	45	48	37	277	50	50	47	50	24	16	237
16 H16	11-3	95	88	90	4	91	86	91	93	88	89.80	92	94	96	94	50	43	45	50	48	34	270	49	50	42	45	41	46	273
17 H17	10-1	90	84	109	5	99	98	90	100	98	97	100	96	100	98.67	50	50	50	50	48	27	275	48	50	47	50	38	22	255
18 H18	10-10	80	90	102	5	97	90	92	96	94	93.80	96	80	96	90.67	50	46	40	50	36	39	261	41	46	50	50	41	30	258
19 H19	10-4	90	86	96	3	84	96	93	95	86	90.80	98	98	96	97.34	50	50	48	50	39	43	280	50	50	50	50	50	42	292
20 H20	10-0	80	86	109	5½	90	96	89	82	88	89	98	96	90	94.67	41	50	38	42	48	47	266	47	50	27	50	45	26	245
21 H21	10-11	80			4	96	93	86	88	100	92.60	100	98	100	99.34	49	46	50	50	42	13	250	50	50	43	50	36	40	269
22 H22	11-1	80	65	80	4	93	99	87	96	94	93.80	100	96	100	98.67	50	50	50	34	38	29	251	48	45	38	50	36	33	250
23 H23	11-3	90	70	65	4	98	97	98	80	98	94.20	92	94	92	92.67	50	50	40	40	50	39	269	50	50	40	32	43	30	245
24 H24	13-5	90	46	77	5	97	100	95	98	100	98.	100	100	98	99.34	50	50	42	50	47	28	267	47	49	50	50	48	31	275
25 H25	12-9	90	62	84	5	100	99	93	98	100	98	Moved out of town - - -																	
26 H26	11-9	70	64	90	5½	97	98	94	96	96	96.20	98	68	96	87	50	50	50	50	24	29	253	50	50	40	50	12	25	227
27 H27	11-0	70	71	102	4	94	91	68	95	82	86	88	92	92	90.67	50	50	30	42	42	17	231	41	42	29	42	38	12	204
28 H28	14-7	30	67	65	5½	96	94	91	97	96	94.80	98	98	96	97.	50	50	30	49	33	29	241	50	50	25	50	40	14	229
29 H29	10-7	95	70	66	5	92	89	89	98	98	93.20	92	94	96	94.	50	50	50	50	45	23	268	50	50	40	50	48	26	264
30 H30	12-4	90	79	104	4	99	100	93	98	100	98	98	96	100	98	50	50	40	50	48	43	281	46	50	50	42	40	22	250
31 H31	13-3	30	72	71	6½	97	98	94	98	98	97	96	94	98	96	Absent	-	-	-	-	-		50	45	40	41	0	36	212
32 H32	10-10	85	79	73	4	93	93	73	95	96	90	98	90	94	94	45	42	36	50	42	42	257	46	40	39	41	18	23	207
33 H33	10-9	95	100	99	3	98	90	93	95	86	92.40	90	98	98	95.34	41	46	26	34	50	40	237	50	50	40	23	45	31	249
34 H34	11-2	70	83	85	5	99	98	90	75	90	90.40	Not promoted - - -																	
35 H35	11-4	90	91	121	4	96	98	95	98	94	96.20	98	92	98	96.34	50	46	50	42	50	33	271	50	50	30	49	43	22	244
36 H36	10-9	85	86	98	4½	95	91	82	75	86	85.80	94	96	96	95.34	50	46	50	24	47	17	234	46	50	25	29	9	40	199
37 H37	10-9	85	87	103	3	97	92	70	90	88	87.40	92	98	98	96.34	50	50	23	42	50	31	246	41	50	30	49	32	42	244
38 H38	11-1	70	81	90	5	91	87	87	90	98	90.60	98	94	90	94	50	40	40	50	20	31	231	46	34	28	49	23	26	206
39 H39	12-6	30	58	107	5	93	68	71	57	48	67.40	70	82	86	79.34	38	30	23	23	6	17	137	50	32	46	24	4	24	180

Table I (Continued) Regular Program Group.

(Instructions for reading Precedes Table X.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Name	Age	Teacher's Rating of Pupil.	Intelligence Scores Jan. 11, 1933 Kuhlman-Anderson Grade	Jan. 12, 1933 Haggerty Delta 2.	Arithmetic History (Yrs.)	Wilson Inventory & Diag Tests Dec. 6/33 3P Add.	Dec. 7/33 4P Subt.	Jan. 6/33 5P Mult.	Jan. 9/33 6P1. S. Div.	Jan. 10/33 6P2. L. Div.	Average for Wilson Inv. Tests	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average for Composite Tests	Wilson General Survey Test Form I March 17, 1933 Survey I Add.	Subt.	Mult.	Div.	Frac.	Arith. Business	Total Score for Survey Form I	Wilson General Survey Test Form II May 19, 1933 Survey II Add.	Subt.	Mult.	Div.	Frac.	Arith. Business	Total Score for Survey Form II
40	H40	10-3	70	91	93	5	87	85	73	66	76	77.40	84	94	88	88.67	47	50	46	34	41	34	252	50	45	27	31	44	30	227
41	H41	11-5	70	84	—	5½	99	94	89	93	96	94.20	92	96	96	94.67	50	43	47	42	47	27	256	50	50	27	45	45	22	239
42	S1	10-9	90	88	89	3	93	98	99	96	92	95.60	96	94	94	94.67	50	50	50	50	38	37	275	50	50	35	40	46	42	263
43	S2	14-11	65	71	73	8½	99	85	81	76	66	81.40	80	76	86	80.67	50	46	37	29	25	38	225	48	47	32	27	11	6	171
44	S3	12-7	90	97	91	5	95	98	92	89	84	91.60	100	100	90	96.67	44	43	37	41	31	32	228	48	50	28	44	27	36	233
45	S4	11-8	85	72	82	4	99	93	91	99	92	94.80	98	98	94	96.67	50	50	37	42	15	32	226	50	50	48	42	21	32	243
46	S5	11-2	95	70	84	3	94	96	99	99	100	97.60	100	100	98	99.34	50	50	40	34	29	29	232	37	39	27	50	43	50	246
47	S6	12-5	60	63	72	4	98	79	63	59	38	67.40	76	74	64	71.34	46	32	21	21	30	47	197	48	36	29	36	7	33	179
48	S7	14-0	95	93	95	7	100	99	99	89	100	97.40	100	92	96	96	50	50	40	50	45	27	262	48	50	40	41	36	41	256
49	S8	12-10	90	58	74	5	99	99	91	75	92	91.20	88	90	98	92	48	46	50	37	40	24	245	48	47	45	45	26	40	251
50	S9	11-2	80	80	79	3	91	97	94	95	70	89.40	96	96	96	96	50	46	40	41	44	35	256	48	45	38	37	30	27	225
51	S10	10-9	60	79	83	3	96	81	86	94	94	90.20	94	76	94	88	50	42	40	42	34	39	247	50	41	33	49	34	26	233
52	S11	12-4	70	74	85	3	100	96	92	98	94	96	98	100	100	99.34	50	50	50	50	45	47	292	50	45	40	50	44	25	254
53	S12	12-5	85	96	95	5	98	97	83	79	96	90.60	80	92	86	86	50	46	50	48	6	27	227	38	41	25	50	27	20	201
54	S13	14-1	80	67	68	5½	100	99	97	97	98	98.20	96	94	96	95.34	47	49	26	34	21	34	211	50	50	44	40	33	26	243
55	S14	13-2	80	76	82	4	98	99	97	97	88	95.80	100	96	100	98.67	50	50	50	50	45	40	285	50	50	40	42	36	23	241
56	S15	11-3	90	80	82	4	97	99	93	98	78	93	90	92	92	91.34	50	50	34	50	48	25	257	50	45	36	42	27	24	224
57	S16	12-10	90	73	88	4	100	96	94	90	88	93.60	96	96	94	95.34	41	50	37	44	42	26	240	50	50	35	35	21	13	204
58	S17	13-9	90	68	70	5½	79	86	71	95	64	79	82	78	82	80.67	47	33	26	34	15	23	178	50	36	37	34	18	19	194
59	W1	10-6	80	74	95	3	90	99	85	94	92	92	92	98	98	96	50	47	47	50	33	37	264	46	46	47	42	47	33	261
60	W2	11-2	75	78	90	3	63	94	90	98	92	87.40	96	98	100	98	41	50	43	42	37	27	240	47	45	37	50	27	50	256
61	W3	13-7	90	77	107	4	99	95	98	98	94	96.80	100	96	100	98.67	50	50	50	50	44	32	276	50	45	48	50	45	37	275
62	W4	11-0	75	88	104	4	90	99	82	88	88	89.40	96	92	98	95.34	50	42	40	34	38	29	233	48	45	35	49	34	35	246
63	W5	11-5	88	88	104	4	79	99	95	99	98	94	98	96	100	98	46	50	36	42	32	38	244	50	50	40	50	35	32	257
64	W6	11-1	85	76	93	3	95	100	94	96	94	95.80	96	100	100	98.67	43	46	50	50	44	41	274	50	50	38	50	50	35	273
65	W7	11-0	80	89	106	3	96	97	94	97	98	96.40	92	100	96	96	46	50	50	50	38	39	273	38	50	50	50	48	32	268
66	W8	10-8	78	84	89	4	94	99	89	98	90	94	90	92	90	90.67	50	50	30	50	10	28	218	48	45	15	37	39	26	210
67	W9	11-2	80	75	86	3	87	99	91	87	100	72.80	96	100	96	97.34	50	50	50	50	45	30	275	47	50	40	50	44	46	257
68	W10	11-3	75	64	58	4	75	96	97	97	94	91.80	98	98	100	98.67	47	46	47	45	34	32	251	46	50	28	50	30	35	239
69	W11	11-5	78	78	81	3	90	94	84	89	92	89.80	94	100	94	96	41	35	50	50	24	30	230	50	47	47	42	36	32	254
70	W12	11-7	70	64	71	3½	95	100	98	100	100	98.60	96	100	100	98.67	50	50	40	50	38	27	255	50	50	40	42	47	50	279
71	W13	11-0	78	83	97	3	97	98	94	99	100	97.60	98	98	98	98	50	50	50	50	30	25	255	50	50	50	50	45	13	258
72	W14	10-6	80	83	95	2½	84	78	82	96	86	85.20	96	98	96	96.67	50	46	30	46	48	39	258	50	50	37	50	48	42	277
73	W15	10-4	83	73	101	2½	93	96	95	97	94	95	98	94	98	96.67	50	50	40	50	45	39	274	41	47	40	50	30	34	242
74	W16	10-11	78	80	79	3½	93	95	79	87	88	88.40	96	96	96	96	50	50	26	34	43	37	240	46	50	30	34	28	42	230
75	W17	11-10	70	76	114	4	84	91	89	85	84	86.60	90	88	98	92	50	50	50	40	32	33	255	47	50	47	42	12	29	227
76	W18	11-7	75	91	90	4	72	96	74	90	72	80.80	88	90	88	88.67	47	35	27	50	42	40	241	38	50	29	42	32	33	224
77	W19	10-10	88	78	89	3	98	95	92	87	90	92.40	Transferred	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
78	W20	12-5	78	88	92	4	97	96	91	95	96	95	92	98	94	94.67	50	46	40	50	46	31	263	50	50	50	42	45	28	265

Table V (Continued) Regular Program Group (Instruction for reading precedes Table X)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Name	Age	Teacher's Rating of Pupil	Intelligence Scores Jan. 11/33 Kuhlman-Anderson Grade VI	Jan. 12/33 Haggerty Delta 2.	Arithmetic History (yrs)	Wilson Inventory & Diag Tests Dec. 6/32 3P Add.	Dec 7/32 4P Subt.	Jan. 6/33 5P Mult.	Jan. 9/33 6P1. S. Div.	Jan. 9/33 6P2. L. Div.	Average for Wilson Inv. Tests	Composite Tests March 16/33 I	May 17/33 II	May 18/33 III	Average for Composite Tests	Wilson General Survey Test Form I March 17, 1933 Survey I Business Add.	Subt.	Mult.	Div.	Frac.	Arith	Total Score for Survey Form I	Wilson General Survey Test Form II May 19, 1933 Survey Form II Business Add.	Subt.	Mult.	Div.	Frac.	Arith	Total Score for Survey Form II
79	W21	11-2	75	79	91	4	81	94	72	95	96	87.60	92	92	90	91.34	50	50	48	42	21	29	240	50	44	35	42	38	32	241
80	W22	13-5	75	71	83	6	96	99	89	95	98	95.40	100	92	98	96.67	50	47	50	50	45	46	288	46	50	50	42	44	46	278
81	W23	11-5	70	61	80	4	84	93	93	91	98	91.80	90	90	98	92.67	50	43	40	32	10	31	206	47	41	39	42	30	38	237
82	W24	13-7	75	64	69	4	87	99	92	97	94	93.80	100	100	98	99.34	50	46	40	42	30	26	234	48	40	36	42	36	28	230
83	W25	14-7	75	57	57	3	93	97	95	97	100	96.40	96	94	98	96	50	50	50	49	30	27	256	48	47	50	50	27	32	254
84	W26	13-4	70	81	66	5	91	95	87	96	90	91.80	90	96	94	93.34	50	46	37	50	32	32	247	50	50	50	50	34	42	276
85	W27	14-2	50	62	72	7	99	83	88	68	78	83.20	92	98	92	94	50	50	50	42	0	22	214	50	45	38	32	0	14	179
86	W28	14-5	50	54	80	6	92	85	87	87	80	86.20	84	94	96	91.34	50	46	50	32	23	26	227	50	36	36	41	8	21	192
87	W29	12-1	70	54	65	4	81	88	92	89	92	88.40	96	92	88	92	50	46	27	42	10	35	210	39	40	35	41	12	33	200
88	W30	10-11	75	62	85	3	98	96	83	81	96	90.80	96	90	98	94.67	47	46	44	37	16	39	229	50	50	40	49	30	30	249
89	W31	15-1	70	64	62	4	95	95	85	94	96	93	94	94	100	96	50	46	37	50	23	44	250	50	50	40	42	30	36	248
90	W32	11-10	65	64	72	3	97	99	93	96	98	96.60	96	100	96	97.34	46	46	40	50	24	35	241	50	45	27	50	38	42	252
91	W33	11-8	73	57	70	3	98	92	97	95	84	93.20	94	100	98	97.34	50	50	50	42	24	34	250	50	50	50	50	27	50	277
92	W34	12-6	65	58	62	4	84	92	86	84	90	87.20	96	86	96	92.67	38	50	40	37	0	38	203	50	50	33	50	0	30	213
93	W35	12-4	70	71	97	2	89	96	72	83	86	85.20	78	98	88	88	50	50	26	41	6	39	212	50	50	40	41	12	43	236
94	W36	13-5	50	38	61	4½	92	87	78	74	48	75.80	76	84	90	83.34	36	47	26	24	2	13	148	40	38	49	24	2	9	162
95	W37	12-2	65	50	77	3	95	86	89	78	72	84	76	74	94	81.34	41	42	40	24	10	34	191	45	45	31	24	9	17	171
96	W38	11-5	70	59	62	3	95	92	94	99	96	95.20	96	98	96	96.67	50	43	50	34	4	32	213	46	50	50	50	32	26	254
97	W39	10-8	85	83	112	3	86	92	94	97	98	93.40	98	98	96	97.34	50	46	30	42	32	36	236	46	45	50	42	26	17	226
98	W40	14-9	35	44	48	6	84	70	75	65	18	62.40	72	84	90	82	50	46	25	23	10	34	188	50	46	25	36	10	24	191
99	W41	10-3	75	64	98	3	84	97	83	94	98	91.20	98	98	98	98	50	50	50	42	7	33	232	50	50	40	42	18	40	240
100	W42	12-3	75	63	96	3	86	97	90	99	100	94.40	98	98	98	98	50	50	50	50	8	42	250	50	39	36	50	12	46	233
101	W43	11-7	85	65	90	3	97	100	83	78	90	89.60	86	94	94	91.34	50	42	27	24	24	40	208	46	46	28	37	31	38	226
102	W44	11-2	80	74	88	3	98	93	98	93	98	96	94	100	94	96	47	50	40	50	36	27	240	50	50	50	50	38	35	273
103	W45	13-8	75	79	87	4	98	95	91	88	96	93.60	88	94	96	92.67	50	47	44	42	33	44	260	50	50	30	42	44	42	258
104	W46	10-10	60	51	66	3	73	89	86	94	86	85.60	84	84	96	88	41	42	39	32	8	29	191	48	40	23	33	8	27	179
105	W47	11-5	75	67	78	3	92	96	90	96	94	93.60	100	92	98	96.67	50	39	38	48	4	26	205	44	50	34	37	27	40	232
106	W48	12-0	60	40	80	3	93	96	84	88	74	87	92	86	92	90	41	42	35	42	20	23	203	50	47	37	42	18	13	207
Median		11.60	78.95	75.29	86.88	4.20	95.47	95.79	90.66	95.10	93	92.20	95.78	94.59	96.44	95.45	50	49.45	42.69	44.54	34.84	32.84	248.75	50	50	39.32	44.44	34.	31.25	241.88
Average		11.91	77.50	74.30	86.38	4.77	93.07	94.10	88.68	91.32	90.86	91.04	94.05	93.45	95.75	94.40	47.58	48.28	42.10	43.71	32.90	32.65	243.26	46.70	46.05	39.10	44.	31.35	31.75	236.55
S. Dev.		1.23	15.15	13.	14.55	1.16	7.25	5.90	7.65	9.05	13.30	6.55	6.70	7.55	5.90	5.60	4.10	5.	8.90	9.20	14.25	7.60	29.05	4.40	5.10	8.60	7.15	13.70	10.40	28.15

Table shows in column form the Medians, Averages, and Standard Deviations of the above table.

SUMMARY FOR TABLES X AND Y

	EXPERIMENTALS			REGULAR PROGRAM			For
	Med.	Av.	S. D.	Med.	Av.	S. D.	Reg.
Ages	11.21	11.46	1.72	11.60	11.91	1.23	+ .45
History	.34	.77	1.21	4.30	4.77	1.16	+ 4.
Teacher's Rating	82.50	80.20	11.65	78.95	77.50	15.15	- 2.70
Kuhlman-Anderson	68.75	66.88	14.75	75.29	74.30	13.	+ 7.42
Haggerty Delta 2	80.83	80.40	19.10	86.88	86.38	14.55	+ 5.98
Dec.6-7/32 and Jan.6-9-10/33							
Inventory: Av.	77.91	76.46	15.10	92.20	91.04	6.55	+14.58
Add.	93.41	91.40	6.70	95.47	93.07	7.25	+ 2.67
Subt.	90.38	84.82	16.60	95.79	94.10	5.90	+ 9.28
Mult.	80.36	76.30	14.75	90.66	88.68	7.65	+12.38
S. Div.	79.17	72.50	22.05	95.10	91.32	9.05	+18.82
L. Div.	67.86	59.57	30.65	93.	90.86	13.30	+31.29
Composite Tests: March16/33 May 17-18/33							
Composite I	91.	86.56	14.25	95.78	94.05	6.70	+ 7.49
Composite II	92.14	86.86	15.65	94.59	93.45	7.55	+ 6.59
Composite III	94.	90.58	12.	96.44	95.75	5.90	+ 5.17
Survey I: March 17/33							
Add. Sec.1.	50.	47.09	5.10	50.	47.58	4.10	+ .49
Subt. " 2.	47.84	45.16	9.	49.45	48.28	5.	+ 3.12
Mult. " 3.	34.77	35.60	11.70	42.69	42.10	8.90	+ 6.50
Div. " 4.	34.26	36.55	12.65	44.54	43.71	9.20	+ 7.16
Frac. " 5.	9.67	14.86	14.15	34.84	32.90	14.25	+28.04
B. Know. 6.	31.88	31.28	8.75	32.84	32.65	7.60	+ 1.37
Total Score	213.75	211.10	29.50	248.75	243.26	29.05	+32.16
Survey II: May 19/33							
Add. Sec.1.	50.	45.84	5.85	50.	46.70	4.40	+ .86
Subt. " 2.	49.88	46.20	9.50	50.	46.05	5.10	+ 2.35
Mult. " 3.	37.64	36.01	10.70	39.32	39.10	8.60	+ 3.09
Div. " 4.	42.50	40.81	10.60	44.24	44.	7.15	+ 3.19
Frac. " 5.	24.72	22.50	12.20	34.	31.35	13.70	+ 8.85
B. Know. 6.	26.39	26.98	9.25	31.25	31.25	10.40	+ 4.27
Total Score	220.63	213.55	37.05	241.88	236.55	28.15	+ .23

TABLE Z.

MID-YEAR ENTRANCE CLASS TO THE SIXTH GRADE JANUARY 1933.

NO FORMAL TRAINING IN ARITHMETIC.

(Instructions for reading this table follows data.)

Pupil's school and number	Pupil's age	Addition	Subtraction	Mult.	Short Div.	Long Div.
Mid-B1	10	70	0	0	0	0
Mid-B2	10	79	26	0	3	0
Mid-B3	10	45	0	0	0	0
Mid-B4	10	41	19	0	0	0
Mid-B5	12	72	36	0	8	0
Mid-B6	10	92	1	14	7	0
Mid-B7	10	59	0	14	0	0
Mid-B8	10	59	0	15	0	0
Mid-B9	11	31	17	0	0	0
Mid-B10	12	45	1	0	0	0
Mid-B11	11	86	38	31	14	0
Mid-B12	11	61	0	0	0	0
Mid-B13	11	84	34	14	1	0
Mid-B14	11	76	15	20	8	0
Mid-B15	11	66	26	0	0	0
Mid-B16	10	81	35	13	7	0
Mid-B17	12	90	24	2	7	0
Mid-B18	11	59	1	0	0	0
Mid-B19	10	76	41	0	1	0
Mid-B20	10	90	30	0	0	0
Mid-B21	11	86	25	28	3	0
Mid-B22	10	47	8	3	0	0
Mid-B23	11	76	23	0	0	0
Mid-B24	12	55	1	0	1	0
Mid-B25	10	58	23	0	2	0
Mid-B26	10	44	0	5	0	0
Mid-H1	10	94	96	81	70	86
Mid-H2	11	77	46	42	23	4
Mid-H3	10	92	92	67	81	4
Mid-H4	10	86	78	73	66	8
Mid-H5	10	93	94	68	77	2
Mid-H6	10	91	90	75	24	2
Mid-H7	10	99	91	82	62	0
Mid-H8	10	97	97	72	48	8
Mid-H9	11	96	89	77	56	2
Mid-H10	11	87	74	59	34	2
Mid-H11	11	92	85	54	45	0
Mid-H12	9	86	57	45	44	2
Mid-H13	10	99	97	79	72	0
Mid-H14	11	89	63	38	42	0
Mid-H15	10	97	92	90	85	6
Mid-H16	11	65	73	22	1	0
Mid-H17	10	98	97	80	83	0

TABLE 2.

MID-YEAR PERFORMANCE GRADE TO THE SIXTH GRADE JANUARY 1926.

NO FORMAL TRAINING IN ARITHMETIC.

(Instructions for reading this table follows table.)

Pupil's school and number	Pupil's age	Addition	Subtraction	Multiplication	Reading	Problems
M14-A1	10	70	0	0	0	0
M14-A2	10	74	26	0	2	0
M14-A3	10	43	0	0	0	0
M14-A4	10	41	14	0	0	0
M14-A5	10	72	28	0	8	0
M14-A6	10	82	1	14	7	0
M14-A7	10	59	0	14	0	0
M14-A8	10	50	0	18	0	0
M14-A9	11	81	17	0	0	0
M14-A10	12	45	1	0	0	0
M14-A11	11	86	28	81	14	0
M14-A12	11	81	0	0	0	0
M14-A13	11	84	24	14	1	0
M14-A14	11	74	13	20	3	0
M14-A15	11	86	0	0	0	0
M14-A16	10	81	35	18	7	0
M14-A17	12	90	24	3	7	0
M14-A18	11	86	1	0	0	0
M14-A19	10	73	41	0	1	0
M14-A20	10	80	30	0	0	0
M14-B21	11	86	42	28	3	0
M14-B22	10	47	8	3	0	0
M14-B23	11	78	28	0	0	0
M14-B24	12	85	1	0	1	0
M14-B25	10	88	24	0	2	0
M14-B26	10	44	0	0	0	0
M14-A1	10	94	96	81	70	86
M14-A2	11	46	32	42	23	4
M14-A3	10	92	36	87	21	4
M14-A4	10	86	78	72	86	8
M14-A5	10	98	34	68	77	8
M14-A6	10	91	80	72	34	8
M14-A7	10	99	91	82	82	8
M14-A8	10	97	97	72	48	8
M14-A9	11	98	83	77	86	8
M14-A10	11	87	74	58	34	8
M14-A11	11	92	86	84	45	8
M14-A12	9	98	87	45	44	8
M14-A13	10	99	97	70	72	8
M14-A14	11	89	68	38	48	8
M14-A15	10	97	92	90	80	8
M14-A16	11	98	78	88	1	8
M14-A17	10	98	97	80	82	8

(Table Z continued. Mid-Year Sixth Grade Class January 1933.)

Pupil's No.	Pupil's Age	Add.	Subt.	Mult.	Short Div.	Long Div.
Mid-H18	12	95	55	17	16	2
Mid-L1	10	96	90	38	26	0
Mid-L2	14	69	53	15	2	0
Mid-L3	10	88	62	28	4	0
Mid-L4	10	92	27	12	3	0
Mid-L5	10	89	92	48	9	0
Mid-L6	10	91	79	42	7	0
Mid-L7	10	71	44	17	5	0
Mid-L8	9	94	87	42	9	0
Mid-L9	10	95	68	26	3	0
Mid-L10	11	71	51	26	3	0
Mid-L11	10	88	70	22	3	0
Mid-L12	11	97	87	9	1	0
Mid-L13	11	82	66	33	11	0
Mid-L14	12	88	46	17	2	0
Mid-L15	9	77	58	31	4	0
Mid-L16	10	77	41	23	3	0
Mid-L17	10	93	67	28	3	0
Mid-L18	12	94	68	26	0	0
Mid-Y1	11	62	26	0	0	0
Mid-Y2	11	83	39	26	0	0
Mid-Y3	11	98	34	31	8	1
Mid-Y4	15	95	41	0	16	2
Mid-Y5	10	66	39	0	0	0
Mid-Y6	11	64	28	11	3	0
Mid-Y7	11	95	40	34	15	0
Mid-Y8	11	76	39	0	10	0
Mid-Y9	11	89	40	38	78	0
Mid-Y10	10	73	70	36	20	0
Mid-Y11	11	70	28	19	12	0
Mid-Y12	11	72	35	13	6	0
Mid-Y13	11	67	37	14	10	0
Mid-Y14	10	78	26	0	9	0

The medians and averages for the above Table Z. are as follows:

	Med.	Av.	S. D.
Age	10.97	10.63	.95
Addition	83.75	82.20	16.30
Subtraction	41.66	47.65	30.
Multiplication	20.	27.05	25.70
Short Division	.42	17.65	19.50
Long Division	0.	0.	0.

(Table 2, continued. Mid-Year Sixth Grade Class January 1932.)

Pupil's No.	Pupil's Age	Add.	Subt.	Mult.	Short Div.	Long Div.
M16-M12	11	96	89	17	78	5
M16-L1	10	98	80	38	80	0
M16-L2	14	89	89	15	8	0
M16-L3	10	88	82	38	4	0
M16-L4	10	89	87	18	5	0
M16-L5	10	89	98	48	9	0
M16-L6	10	91	78	42	7	0
M16-L7	10	71	44	17	6	0
M16-L8	9	94	87	42	9	0
M16-L9	10	86	88	28	9	0
M16-L10	11	71	81	36	9	0
M16-L11	10	88	70	28	5	0
M16-L12	11	87	87	9	1	0
M16-L13	11	86	86	38	11	0
M16-L14	12	88	46	17	0	0
M16-L15	9	77	88	31	4	0
M16-L16	10	77	41	28	8	0
M16-L17	10	86	87	28	8	0
M16-L18	12	94	83	36	0	0
M16-Y1	11	88	88	0	0	0
M16-Y2	11	88	88	28	0	0
M16-Y3	11	98	96	31	8	1
M16-Y4	12	96	91	0	12	2
M16-Y5	10	86	79	0	0	0
M16-Y6	11	94	79	11	8	0
M16-Y7	11	96	90	24	16	0
M16-Y8	11	78	89	0	10	0
M16-Y9	11	89	90	28	78	0
M16-Y10	10	73	70	28	60	0
M16-Y11	11	70	88	18	12	0
M16-Y12	11	72	85	12	8	0
M16-Y13	11	87	87	14	10	0
M16-Y14	10	78	88	0	8	0

AMOUNT OF WORK DONE AND PERSONAL REACTIONS OF EXPERIMENTAL TEACHERS

Mr. Benezet has permitted each experimental teacher to work out her own arithmetic program with the understanding that at the end of two years these pupils must be ready for high school work.

In order to make a study of how much formal arithmetic instruction these experimental pupils had had up to the time of the Wilson Inventory and Diagnostic Process Tests, December 6, 1932, and how much could really be accomplished in the short space of three months, the following information was called for:

Teacher's name

School

Grade

How much work have you accomplished since the beginning of school in September to December 6, 1932? (First semester) In detail, list all materials used and emphasize any particulars.

Will you kindly state whether you anticipated any of the last three process tests, and taught anything in advance of your program?

Will you kindly state your personal reactions to the experiment to date? (December 6, 1932)

EXPERIMENTAL TEACHERS' REACTIONS TO THE WORK

Comments of Teacher #1.

I have made out an account of the work taught (from September 1932 to February 6, 1933) to the children who took the tests in arithmetic. This was an experimental group and had had no formal arithmetic prior to September 1932.

Anticipating what these tests might contain, I taught multiplying, by zeros in multipliers and by three and four place multipliers, and dividing, by three figure divisors and zeros in quotient, in advance of my original plan.

I feel very much satisfied with the results of these tests. They have convinced me that, formerly much precious time was wasted, or made much less pleasant for the children, who were trying to master the work which has been covered by these children, in one-half year.

This work has been accomplished with great enthusiasm on the part of the children who looked forward eagerly to this period.

Reports from the teacher, who now has the majority of these children, are very gratifying. She states that the children are sure of their fundamentals and work independently with much more accuracy than children of traditional groups. They grasp work much more quickly and much of the boresome drill is thus eliminated.

Comments of Teacher #2:

Personally, I feel that the children as a whole did very well on the tests considering the short time arithmetic has been taught.

I feel that the tests are proving the contention that arithmetic can be deferred until the fifth or sixth grade with great profit. I feel, after watching the experiment in this class for four years, that the experiment is accomplishing its end. I feel more than satisfied with my results.

Comments of Teacher #3:

The test results were as good as I expected. The pupils are slow thinkers and the results compare no higher than the rest of their work.

Comments of Teacher #4:

The results were as good, and in some cases better than I expected.

At the beginning of this study it was stated that there was a break in time between the addition and subtraction tests given December 6-7, 1932 and the multiplication, short division, and long division tests given January 6-9-10, 1933 due to a delay in receiving these tests from the publishers and also the intervention of the Christmas vacation. In requesting whether or not the teachers had taught anything in advance of their program, it was the intention of the writer to note the reaction of the teachers and pupils and to see what had been accomplished if this emergency time had been utilized.

As a result of the request, the following information was submitted and shows that two out of the four experimental classes had not yet finished learning the processes which they were now called upon to do.

The following substantiates the above:

Teacher #1.

"Anticipating what these tests might contain, I taught multiplying by zeros in multipliers and by three and four place multipliers and dividing, by three figure divisors and zeros in quotient, in advance of my original plan."

Teacher #2.

"Introduced a little long division but only as an aid, and a chance to see what they would do with it in the test. (It does not yet come in our work.) Taught it in about six demonstrations comparing it with short division, but no solid, lengthly drill as yet on long division."

STATEMENT OF WORK ACCOMPLISHED

Information furnished by Teacher #1

Arithmetic taught in 6B from September to February 3, 1933

I. Reading and writing Arabic numbers through millions

II. Addition

A. 100 Combinations

B. Addition of whole numbers

1. Single column (two, three, etc. to ten addends)

2. Two, three, four, and five place numbers (with and without carrying) seven addends, including zeros in some addends

3. Broken columns, or addends with different numbers of digits

C. Addition of United States money

D. Checking

III. Subtraction (Additive Method)

A. 100 Combinations

B. Subtraction of whole numbers

1. Subtract two, three, four, five, and six place subtrahends from two, three, four, five, six and seven place minuends (with and without carrying)

2. Zeros in minuend, in subtrahend, and in both

C. Subtraction of United States money

D. Checking

IV. Multiplication

A. Tables through twelves

B. Multiplying two, three, four, and five place multiplicand by one, two, three, and four place multipliers

C. Multiplying by zeros in multiplicand and multiplier

D. United States money (decimal point in product)

E. Checking by reversing the multiplier and later by division

V. Division

A. Tables through twelves

B. Short division

1. Four and five place dividends
2. Writing remainders as fractions
3. Zeros in dividend
4. U. S. money as a dividend
5. Checking by multiplication
6. Finding averages

C. Long division

1. Two and three figure divisors
2. Final zeros in divisors and dividends
3. Zeros in divisors and dividends
4. Zeros in quotient
5. U. S. money (dividend)

VI. 6. Checking by multiplication

VI. Roman Numerals through "M"

VII. Denominate numbers

A. Dry--Qt.-pk.-bu.

B. Linear--in.-ft.-yd.

C. Liquid--pt.-qt.-gal.

D. Time--min.-hr.-da.-wk.-mo.-yr.

E. Weight--oz.-lb.-ton

VIII. Fractions

1/2, 1/3, 1/4, 1/5, 1/6, 1/7, 1/8, and 1/9 of any number

Information furnished by Teacher #2

Started arithmetic September 5, 1932

Text used--Strayer Upton Book I

Aim: To cover everything carefully, as far as possible, during the school year to prove how much children can quickly absorb after a long period of no arithmetic whatsoever until 6B Grade, due to the fact that their minds are then ready to quickly grasp the meaning of the printed page because of the intensive drill for five years on English spoken and written.

On December 21, 1932

A period of 14 weeks 2 days

12½ weeks

63 actual school days

31½ hrs. of teaching

I. Completed work mapped out in Book I up to page 152

II. Have studied:

12 multiplication tables

12 division tables

III. Took up:

1. Addition
2. Subtraction
3. Short division

IV. Also taught the terms used and the proof process for each of the four types.

V. Introduced a little long division, but only as an aid, and a chance to see what they could do with it in the test.(It does not yet come in our work.) Taught it in about six demonstrations, comparing it with short division, but no lengthly drill as yet on long division.

VI. Took up the tables of

1. Liquid Measure
2. Dry "
3. Linear "
4. The use of a Scale of Measure

VII. Took up--Dividing a whole into parts

1/2, 1/3, 1/4, 1/5, 1/6, 1/7 of numbers

VIII. Took up:

1. Reading and writing numbers to one million
2. Pointing off three places from the right in whole numbers

IX. Taught:

1. Dollar sign and cents
2. Decimal point in dollars and cents
3. The right of a decimal point equals less than a whole

Information furnished by Teacher #3

In September, I reviewed the four fundamental processes and from that I taught addition, subtraction, multiplication and division of fractions.

I am now teaching the adding of decimals.

This room was partly experimental.

VI. Took up the tables of

1. Liquid Measure

2. Dry "

3. Linear "

4. The use of a Scale of Measure

VII. Took up--dividing a whole into parts

1/2, 1/3, 1/4, 1/5, 1/6, 1/7 of numbers

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Information furnished by Teacher #3

In September, I reviewed the four fundamental processes and from that I taught addition, subtraction, multiplication and division of fractions.

I am now teaching the adding of decimals.

This room was partly experimental.

Information furnished by Teacher #4

In preparation for the tests given to the 6B class in arithmetic, I gave no special or advance instruction on the subject to be given but simply followed the outline I had planned. I have twenty-minute periods daily in arithmetic besides using flash cards or drill on tables for five minutes. In the fifth grade, the pupils had some problems and work in the four fundamentals and simple fractions but no drill nor special period for arithmetic.

The work the 6B class has done beginning in September 1932 is as follows:

Addition: columns of one figure; columns of two, three, and four figures; dollars and cents; problems; flash cards and oral drill work.

Subtraction: examples and problems with one, two, three and four figures; dollars and cents; flash cards and oral drills.

Multiplication: by one, two, and three figures; by 10, 100, and 1000; by a number ending in a 0; flash cards and oral drills. Multiplication tables 2 to 12 inclusive.

Division: short division; long division by two figures; a few simple examples with a three-figure divisor; flash cards; problems; dollars and cents in dividend. Fractional parts of numbers as 1/4, 3/4, 1/3, 2/3, etc.

Fractions: fractional parts; reducing to lowest terms; reducing improper fractions; adding fractions as 4ths and 8ths, 3rds and 6ths; subtraction of

Information Furnished by Teacher #4

In preparation for the tests given to the 6B class in arithmetic, I gave no special or advance instruction on the subject to be given but simply followed the outline I had planned. I have twenty-minute periods daily in arithmetic besides using flash cards or drill or tables for five minutes. In the fifth grade, the pupils had some problems and work in the four fundamentals and simple fractions but no drill nor special period for arithmetic.

The work the 6B class has done beginning in September 1932 is as follows:

Addition: columns of one figure; columns of two, three, and four figures; dollars and cents; problems; flash cards and oral drill work.

Subtraction: examples and problems with one, two, three and four figures; dollars and cents; flash cards and oral drills.

Multiplication: by one, two, and three figures; by 10, 100, and 1000; by a number ending in a 0; flash cards and oral drills. Multiplication tables 2 to 12 inclusive.

Division: short division; long division by two figures; a few simple examples with a three-figure divisor; flash cards; problems; dollars and cents in dividend. Fractional parts of numbers as 1/4, 2/4, 1/2, 2/3, etc.

Fractions: fractional parts; reducing to lowest terms; reducing improper fractions; adding fractions as 4ths and 8ths, 3rds and 6ths; subtraction of

fractions (without borrowing); adding and subtracting of simple mixed numbers.

Simple examples in denominate numbers using tables of Length, Time, and Weight.

Haggerty Intelligence Examination

DELTA 2

FOR GRADES 3-9

Arranged and standardized by M. E. Haggerty, University of Minnesota

---

My name is Ralph (First name) Clark (Last name) I am a boy (Write boy or girl)

This is the 11th day of January 19 33 I am 10 years old.

My next birthday will be May 11 19 33 I am in first half of Grade 6

The name of my school is Youngsville The name of my city (county) is Manchester

The name of my state is New Hampshire

Do not turn this page until you are told to do so.

(To be read silently by pupils while examiner reads aloud)

This little book contains some exercises which will show how well you can do certain things. Some of the things are very easy and some are very hard. There are six exercises in all. You will be shown them one at a time and will finish each one before you see the next one. Do not turn any page until you are told to do so. As soon as you turn the page, lift your pencil, with your elbow on your desk, and do not put your pencil down until we have read the instructions and until I say, GO!

Now turn the page to Exercise 1.

Exercise	1	2	3	4	5	6	Total
Score	34	8	13	18	12	27	112

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EXERCISE 6

Look at this sentence: People hear with the eyes — ears — nose — mouth.
The correct word is "ears," because it makes the truest sentence. In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words that makes the truest sentence. If you cannot be sure, guess. The first one is already marked as it should be.

France is in Europe Asia Africa Australia.

1 The apple grows on a shrub vine tree bush 1
2 The day before Thursday is Tuesday Wednesday Friday Saturday 2
3 America was discovered by Drake Hudson Cabot Columbus 3
4 The first President of the United States was Lincoln Washington Jackson Garfield 4
5 The capital of the United States is New York Chicago Washington New Orleans 5

6 Wool is obtained from the ocean the ground a plant an animal 6
7 The Amazon is a river city mountain country 7
8 Boston is in Connecticut Rhode Island Maine Massachusetts 8
9 The capital of France is London Rome Paris Berlin 9
10 The second month before July is August May June April 10

11 The number of days in a year is 144 287 365 412 11
12 The Leghorn is a kind of cow horse granite fowl 12
13 Charlie Chaplin is noted as an actor soldier preacher physician 13
14 The commander of the allied armies was Wilson Foch Lloyd George Hindenburg 14
15 Moses was a great Greek Roman Japanese Jew 15

16 Shakespeare is noted as a soldier statesman writer scientist 16
17 A pound of tea usually costs about 10 cts. 5 cts. $2.00 50 cts. 17
18 Ivory is obtained from elephants oysters mines reefs 18
19 The Durham is a kind of horse cow goat sheep 19
20 Indigo is a food drink color fabric 20

21 It is usually coldest at sunrise sunset noon midnight 21
22 The U. S. School for army officers is at Annapolis West Point New Haven St. Paul 22
23 Leap year comes every two years four years six years eight years 23
24 Rubber is obtained from ore petroleum trees hides 24
25 Darwin was most famous in literature politics war science 25

26 The battle of Lexington was fought in 1620 1775 1812 1864 26
27 Combustible things will rip fight burn break 27
28 Emeralds are usually red blue yellow green 28
29 Diamonds are obtained from mines reefs elephants oysters 29
30 Turpentine is obtained from rivers rocks trees animals 30

31 The saber is a kind of musket sword cannon pistol 31
32 The larynx is in the head neck shoulder abdomen 32
33 Larceny is a term used in medicine theology law pedagogy 33
34 Alfalfa is a kind of corn hay print rice 34
35 Maroon is a kind of food fabric drink color 35

36 The clarinet is used in music stenography lithography drawing 36
37 The mimeograph is a kind of typewriter copying machine phonograph pencil 37
38 The constitution of the league of nations was written in France Russia England Germany 38
39 Monogamy is a term relating to electricity business the family manufacture 39
40 A five-sided figure is called a scholium pentagon parallelogram trapezium 40

Score .....

EXERCISE 1

DIRECTIONS.

1. Read this question: Do cats see? NO YES
   The right answer is Yes; so a line is drawn under Yes.

2. Read the next question: Is coal white? NO YES
   The right answer is No; so a line is drawn under No.

Below are a great many more questions. Read them carefully, one at a time, and draw a line under the right answer. When you are not sure, guess.

---

1. Do dogs run? YES NO
2. Can a doll sing? YES NO
3. Does the sun shine? YES NO
4. Do men drink water? YES NO
5. Are all apples red? YES NO
6. Does a table have legs? YES NO
7. Are eggs good to eat? YES NO
8. Are two more than four? YES NO
9. Are children's dresses always blue? YES NO
10. Are houses sometimes made of bricks? YES NO
11. Do soldiers ever live in camps? YES NO
12. Does it rain every morning? YES NO
13. Do all travelers have companions? YES NO
14. Is south different from north? YES NO
15. Do pupils attend school at midnight? YES NO
16. Does lightning sometimes occur at night? YES NO
17. Do guards ever take captives? YES NO
18. Are all barbers wealthy persons? YES NO
19. Does the country need patriotic citizens? YES NO
20. Should school teachers be continually tardy? YES NO
21. Are all swimming animals quadrupeds? YES NO
22. Is the development of trees ever stunted? YES NO
23. Is electricity used only for lighting? YES NO
24. Do all foreigners make good citizens? YES NO
25. Is the government of colonies important? YES NO
26. Are future events definitely predictable? YES NO
27. Is hospitality likely to be appreciated? YES NO
28. Are missionaries ever persecuted by natives? YES NO
29. Is a faithless commander deserving of reward? YES NO
30. Do governors ever issue proclamations? YES NO
31. Does the ascent of a mountain conduce to fatigue? YES NO
32. Do arguments arise over political questions? YES NO
33. Should a sentinel's challenge be ignored? YES NO
34. Are integrity and obedience virtues? YES NO
35. Are historians infallible? YES NO
36. Are "patriotism" and "elocution" synonyms? YES NO
37. Does allegiance imply loyalty? YES NO
38. Is surgery the vocation of diplomats? YES NO
39. Are all lunatics in penitentiaries? YES NO
40. Are judicial decisions ever enforced? YES NO

*Number right*_____
*Number wrong*_____
Number right **minus** *Number wrong*_____ (*Score*)

EXERCISE 5

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE

Why do we use stoves? Because
- ☐ they look well
- ☒ they keep us warm
- ☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

---

1 Cats are useful animals, because
- ☒ they catch mice
- ☐ they are gentle
- ☐ they are afraid of dogs

2 Why are chairs made of wood? Because
- ☒ wood is cheap and light
- ☐ wood burns
- ☐ wood is easily broken

3 A house is better than a tent, because
- ☐ it costs more
- ☒ it is more comfortable
- ☐ it is made of wood

4 Shoes are made of leather, because
- ☐ it is tanned
- ☒ it is tough, pliable, and warm
- ☐ it can be blackened

5 Why judge a man by what he does rather than by what he says? Because
- ☐ what a man does shows what he really is
- ☒ it is wrong to tell a lie
- ☐ a deaf man cannot hear what is said

6 If you were asked what you thought of a person whom you didn't know, what should you say?
- ☒ I will go and get acquainted
- ☐ I think he is all right
- ☐ I don't know him and can't say

7 Why does it pay to get a good education? Because
- ☒ it makes a man more useful and happy
- ☐ it makes work for teachers
- ☐ it makes demand for buildings for schools and colleges

8 If the grocer should give you too much money in making change, what is the right thing to do?
- ☐ buy some candy from him with it
- ☐ give it to the first poor man you meet
- ☒ tell him of his mistake

☞ Go to No. 9 above.

9 If you are lost in a forest in the daytime, what is the thing to do?
- ☐ hurry to the nearest house you know of
- ☐ look for something to eat
- ☒ use the sun or a compass for a guide

10 The feathers on a bird's wings help him to fly, because they
- ☒ make a wide, light surface
- ☐ keep the air off his body
- ☐ keep the wings from cooling off too fast

11 Why are criminals locked up?
- ☒ to protect society
- ☐ to get even with them
- ☐ to make them work

12 Why should all parents be made to send their children to school? Because
- ☒ it prepares them for later life
- ☐ it keeps them out of mischief
- ☐ they are too young to work

13 Why do inventors patent their inventions? Because
- ☒ it gives them control of their inventions
- ☐ it creates a greater demand
- ☐ it is the custom to get patents

14 A train is harder to stop than an automobile, because
- ☐ it is longer
- ☒ it is heavier
- ☐ the brakes are not so good

15 We see no stars at noon, because
- ☐ they have moved around to the other side of the earth
- ☐ they are so much fainter than the sun
- ☐ they are hidden by the sun

16 Why is it colder nearer the poles than near the equator? Because
- ☐ the poles are always farther from the sun
- ☐ the sunshine falls obliquely at the poles
- ☐ there is more ice at the poles

*Score*_____

EXERCISE 2

Get the answers to these problems as quickly as you can. Use the side of this page to figure on if you need to.

SAMPLES
1 How many are 5 men and 10 men? ..... Answer (15)
2 If one pencil costs 5 cents, what will 4 pencils cost? ... Answer (20)

1 How many are 30 men and 7 men? ..... Answer (37)
2 A boy had 10 cents and spent 4 cents. How many cents had he left? Answer (6)
3 If you save $7 a month for 4 months, how much will you save? ..... Answer (28)
4 If 24 men are divided into groups of 8, how many groups will there be? There will be 3 ..... Answer (3)
5 A boy had 12 marbles. He bought 3 more, and then lost 6. How many marbles did he have left? he had 9 left ..... Answer (9)
6 Mary was carrying a dozen eggs in her apron. Two eggs fell out and were broken. How many eggs had she left? She had 10 Answer (10)
7 An army advanced 5 miles and retreated 3 miles. How far was it then from its first position? It was two miles ..... Answer (2)
8 How many hours will it take to drive a team 66 miles at the rate of 6 miles an hour? It will take 11 ..... Answer (11)
9 How many apples can you buy for 50 cents at the rate of 2 for 5 cents? You can buy ten ..... Answer (10) ✓
10 A regiment marched 40 miles in five days. The first day it marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 8 miles. How many miles did it march the last day? It went 5m Answer (5) ✓
11 If you buy two writing tablets at 7 cents each and a book for 65 cents, how much change should you get from a two-dollar bill? ..... Answer ($1,37) ✓
12 If there are 5 school days in a week, 4 weeks in a month, and 9 months in a school year, how many school days are there in a school year? ..... Answer ( )
13 A dealer bought some mules for $800. He sold them for $1000, making $40 on each mule. How many mules were there? ..... Answer ( )
14 A rectangular bin holds 400 cubic feet of corn. If the bin is 10 feet long and 5 feet wide, how deep is it? ..... Answer ( )
15 If it takes 6 men 3 days to dig a 180-foot drain, how many men are needed to dig it in half a day? ..... Answer ( )
16 A soldier spent one eighth of his money for post cards and four times as much for a box of letter paper, and then had 90 cents left. How much money did he have at first? ..... Answer ( )
17 If $3\frac{1}{2}$ tons of coal cost $21, what will $5\frac{1}{2}$ tons cost? ..... Answer ( )
18 A ship has food to last her crew of 500 men 6 months. How long would it last 1200 men? ..... Answer ( )
19 If a man runs a hundred yards in 10 seconds, how many feet does he run in a fifth of a second? ..... Answer ( )
20 A submarine makes 8 miles an hour under water and 15 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go two fifths of the way under water? ..... Answer (8)

Score .....

EXERCISE 4

Look at these two words: little—small same—opposite

They mean the same thing; so a line is drawn under same.

Now look at the next two words: good—bad same—opposite

These two words do not mean the same. They mean just the opposite; so a line is drawn under opposite.

Now look at all the other words on this page. If the words of a pair mean the same or nearly the same, draw a line under same. If they mean the opposite or nearly the opposite, draw a line under opposite. If you cannot be sure, guess.

1	no—yes	same—opposite	1
2	big—large	same—opposite	2
3	leap—jump	same—opposite	3
4	day—night	same—opposite	4
5	cold—hot	same—opposite	5
6	wet—dry	same—opposite	6
7	in—out	same—opposite	7
8	wide—broad	same—opposite	8
9	bitter—sweet	same—opposite	9
10	slim—slender	same—opposite	10
11	go—leave	same—opposite	11
12	begin—commence	same—opposite	12
13	take—accept	same—opposite	13
14	find—lose	same—opposite	14
15	joy—happiness	same—opposite	15
16	asleep—awake	same—opposite	16
17	command—obey	same—opposite	17
18	beg—entreat	same—opposite	18
19	appeal—beseech	same—opposite	19
20	legible—readable	same—opposite	20
21	ancient—modern	same—opposite	21
22	lax—strict	same—opposite	22
23	acquire—lose	same—opposite	23
24	sacred—hallowed	same—opposite	24
25	compute—calculate	same—opposite	25
26	repress—restrain	same—opposite	26
27	bestow—confer	same—opposite	27
28	amenable—tractable	same—opposite	28
29	avert—prevent	same—opposite	29
30	contradict—corroborate	same—opposite	30
31	dearth—scarcity	same—opposite	31
32	prefix—append	same—opposite	32
33	amiable—surly	same—opposite	33
34	docile—refractory	same—opposite	34
35	celibate—married	same—opposite	35
36	extinct—extant	same—opposite	36
37	pertinent—relevant	same—opposite	37
38	diatribe—invective	same—opposite	38
39	apathy—indifference	same—opposite	39
40	fallacy—verity	same—opposite	40

Number right 29

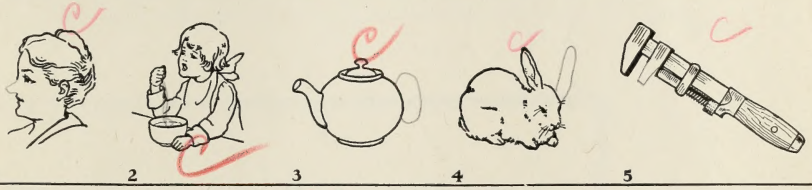
Number wrong 11

Number right **minus** *Number wrong* 18 *(Score)*

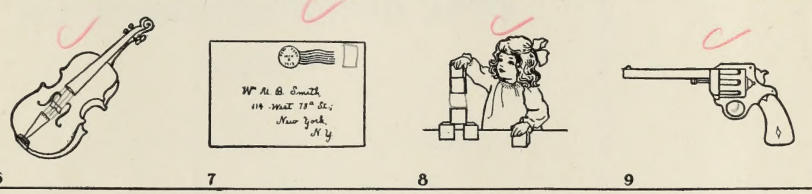
EXERCISE 3

Each of these pictures has something missing, and you are to put in with your pencil the missing part. Look at the first one. It is the picture of a boy's face, but it has no mouth. Now with your pencil mark in a mouth. The woman has no eye. Give her an eye. The other pictures are to be finished in the same way.

A B

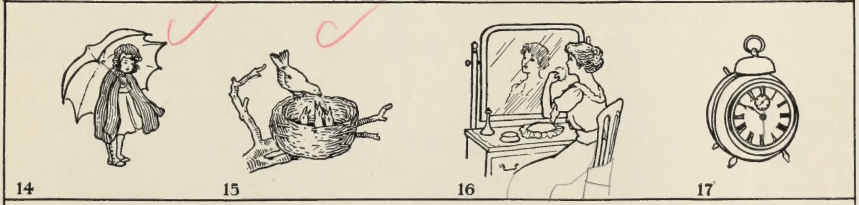


1 2 3 4 5

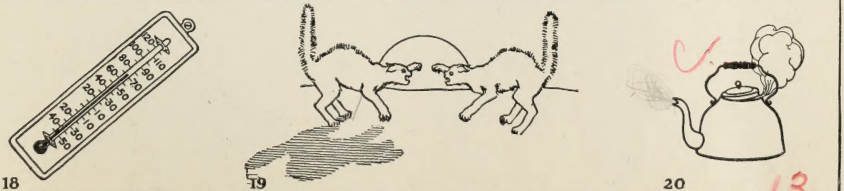


6 7 8 9

10 11 12 13



14 15 16 17



18 19 20

Score 13

Kuhlmann-Anderson Tests

GRADE VI

Name Mary Soterion Grade 6 B

Age on Last Birthday 10

Birthday August (Month) 1. (Day)

School Youngsville

Town Manchester, N. H.

Use Either This Record or the Class Record Sheet

Test No.		Test No.	
23	10	28	8
24	10	29	4
25	8	30	9
26	14	31	11
27	1	32	4

Date Jan. 12 1937

Age 11

Make sure that this is correct. Verify the record.

79

See Instruction Manual, page 17

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EXAMPLES: free good old heavy bad fast
early slow wrong light big right

1. old rich wide poor green full
2. light soon bad sick dark narrow
3. brown open full dark sorry empty
4. laugh now wait whistle study cry
5. soon above when even below back
6. strong fight weak muscle jump work
7. like fun friend cousin enemy skate
8. never where while still quickly always
9. sharp narrow point steep dull study
10. string line straight turn old crooked

EXAMPLES: table top paint legs cloth dishes
tree shade nuts roots leaves branches

1. book — story pages shelf picture printing
2. squirrel — nuts fur tail cage tree
3. cat — hair owner mouse claws milk
4. chair — arms legs rocker seat comfort
5. house — sidewalk window bed furnace door
6. boy — shoes legs suit head knife
7. room — furniture lamp people walls ceiling
8. concert — encore performer violin singing applause music
9. army — officers tents fighting soldiers ships deaths
10. banquet — music wine guests dancing food laughter
11. fire — alarm flame danger heat fireman insurance
12. blizzard — winds death thunder danger snow wrecks
13. club — banquets meetings committees clubhouse fun members
14. trial — sentence crime defendant judge jury guilt
15. contest — opponents crowds rowing strength rivalry dislike

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

EXAMPLES: (A) The third letter of the alphabet is . C

(B) The second letter before the sixth letter is . . . . . D

1. The fifth letter of the alphabet is . . . . . E 1

2. The second letter before the last letter is . . . X 2

3. The third letter before M is . . . . . J 3

4. The letter midway between H and N is 4

5. The second letter after the fourth letter is . . . F 5

6. The letter two letters to the right of the letter E is G 6

7. The first letter to the left of the tenth letter is . . I 7

8. The letters of the word the in the order in which they come in the alphabet are . . . . . eht 8

9. The letters of the word boy in the order in which they come are . . . . . boy 9

10. The word you get by putting the first letter between the two middle letters of the alphabet is . . . 10

EXAMPLES:

table	box	furniture	bed	cloth	wood
apple	cherry	seed	grow	fruit	leaf

1. silk	red	pretty	dress	fashion	cloth
2. salmon	meat	water	swim	fish	food
3. sheep	flock	animal	meat	woolly	butchered
4. diamond	precious	value	sparkles	jewel	ring
5. hammer	carpenter	nail	tool	useful	iron
6. lettuce	vegetable	green	leaves	healthful	garden
7. man	boy	strong	fights	muscle	person
8. gun	shoot	muzzle	weapon	dangerous	wound
9. carpentry	tools	trade	man	wages	house
10. gold	bright	valuable	mineral	ring	money
11. wagon	vehicle	brake	wood	ride	carriage
12. baseball	practice	diamond	healthful	team	sport
13. bee	wax	birds	honey	insect	stings
14. mustard	burns	spice	powder	strong	flavor
15. honesty	excellence	best	virtue	right	desirable

EXAMPLES:

table	box	furniture	bed	cloth	wood
apple	cherry	seed	grow	fruit	leaf

1. silk	red	pretty	dress	fashion	cloth
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7. man	boy	strong	fights	muscle	person
8. gun	shoot	muzzle	weapon	dangerous	wound
9. carpentry	tools	trade	man	wages	house
10. gold	bright	valuable	mineral	ring	money
11. wagon	vehicle	brake	wood	ride	carriage
12. baseball	practice	diamond	healthful	team	sport
13. bee	wax	birds	honey	insect	stings
14. mustard	burns	spice	powder	strong	flavor
15. honesty	excellence	best	virtue	right	desirable

31	16	7	6	13	25	17	26
8	46	18	22	10	23	49	32
31	50	29	27	14	35	26	34
44	37	10	38	41	9	43	21
29	19	28	49	25	27	34	6
50	7	26	21	13	29	44	17
23	18	14	8	46	35	11	41
32	31	38	27	47	28	19	35
9	37	25	19	43	31	16	23

Test No. 27

EXAMPLES:

chair book couch desk box letter
dog cheese dish potato table bread

1. dirt iron force silver wool wire
2. ship waves cart road wagon bricks
3. store banana basket apple seed plum
4. sea rock mountain lake storm river
5. glass hat room ribbon basket dress
6. robin winter horse song squirrel fence
7. rain wind sky steam heat water
8. brass piano violin party pleasure flute
9. submarine officer duty bomb trench gun
10. poetry physics physiology beauty chemistry resonance
11. sermon newspaper manuscript book magazine speech
12. house cave barn hotel store castle
13. paper crayon pencil blackboard pen ink
14. frog feathers fish chicken animal duck
15. gold ruby stone pearl jewel diamond

K-O-B-O book

T-O-F-S soft

1. I-C-H-D-L
2. O-C-A-T coat
3. U-E-O-H-S
4. H-T-E-M
5. C-H-S-O-O-L School
6. N-B-U-M-E-R Number
7. C-R-H-A-I
8. T-W-A-E-R water
9. W-T-E-R-I-N
10. L-T-R-E-T-E
11. P-E-P-A-R Prepar
12. S-R-O-T-E
13. C-R-Y-A-N-O
14. E-P-N-L-C-I
15. F-W-L-O-R-E

EXAMPLES: my not is book that

ran the boy the street down

1. apples trees on grow
2. play boys like marbles to
3. grow boys men to become up
4. is lesson girl her studying the
5. there days are the week in seven
6. children room of the out ran six
7. away winter for nuts store squirrels
8. Mary I runs as as fast
9. do go we Saturday school on not to
10. she youngest selected our the in girl room
11. thousand many a year cars makes Ford
12. true stories teacher about the a told them colonies
13. who her lost girl pencil the another bought
14. allowed upon skate to they never river were the
15. an embankment train leaped lost lives their and many people the

EXAMPLES: girl come ill his

apple shell ripe banana

1. sit can pie big
2. ton sing boy some
3. tell some me can
4. why bury still you
5. are bat out tell
6. truth happy people riches
7. mirth beauty business ugly
8. trill hurry battle leaves
9. tramp lease trial found
10. across bought camel truce
11. makes story tremble asking
12. early income fashion simply
13. anchor sample truth ripple
14. beacon giving nation humble
15. family forgive angel bought

EXAMPLES: quarter nickel dollar dime penny

rod yard inch mile foot

1. gallon gill bushel quart pint
2. township county acre section state
3. one multitude few none many
4. clause syllable sentence letter word
5. infancy adolescence old-age childhood maturity
6. warm cold hot torrid frigid
7. president alderman governor mayor citizen
8. company regiment squad division army
9. colossal tiny small enormous large
10. inaudible distinct deafening faint loud
11. millennium eon century year decade
12. lieutenant corporal general colonel captain
13. frequently occasionally never usually always
14. good naughty wicked mischievous angelic
15. pennyweight pound ounce grain carat

The Wilson General Survey Tests in Arithmetic
Form 1

By G. M. WILSON, Professor of Education, Boston University

NAME Ruth Delahanty AGE 11

TOWN Manchester GRADE 6A

TEACHER Miss Kinsley

To the Pupil: This is a contest covering the simple things in addition, subtraction, multiplication, division, fractions, and business knowledge. It is not a time test. Work carefully. When you have finished, check your work. Give good attention and do your best. Do not ask questions or look around. TRY TO WIN FOR YOUR SCHOOL.

SCORE FORM	
Addition	24
Subtraction	20
Multiplication	30
Division	20
Fractions	10
Business Sit.	10
TOTAL	230

ADDITION

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
8	7	5	1	0	3	0	1	8	0	6	5	5
3	6	4	9	9	8	6	7	9	7	8	9	7
11	13	9	10	9	11	6	8	17	7	14	14	12

(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)
6	3	758	$5.83	8757	$14.69	0	5	4	0	45
9	6	686	5.19	3787	8.54	4	8	7	5	89
15	9	1,444	$11.02	12,544	$23.23	6	5	7	4	66
						7	6	8	9	38
						17	14	16	18	75
										813

SUBTRACTION

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
8	5	8	2	9	7	8	9	2	4	3	9	4	6	8
1	3	6	2	0	3	8	2	1	4	3	6	3	5	2
7	2	2	0	9	4	0	7	1	0	0	3	1	1	6

(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)	(y)	(z)	(a*)	(b*)
9	7	5	9	5	1511	2784	8412	14883	12768	17874	16760	15580
5	7	2	8	5	987	347	2646	1965	4397	3935	6429	8322
4	0	3	1	0	524	2,437	5,766	12,918	8,371	13,939	10,331	7,258

MULTIPLICATION

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
6	8	7	7	0	8	6	5	4	0
5	4	3	6	8	5	9	9	7	0
30	32	21	42	0	40	54	45	28	0

(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)
57	98	986	975	975	978	6897	95407	84654
2	9	2	3	4	7	6	84	67
104	882	1972	2,925	3,900	6,846	41382	36678	5925978
							763250	5679114
							7,669,188	6,271,818

DIVISION

(a) $9\overline{)45}$ 5	(b) $4\overline{)4}$ 1	(c) $3\overline{)24}$ 8	(d) $8\overline{)56}$ 7	(e) $2\overline{)4}$ 2	(f) $7\overline{)14}$ 2
(g) $6\overline{)42}$ 7	(h) $8\overline{)48}$ 6	(i) $9\overline{)54}$ 6	(j) $3\overline{)27}$ 9	(k) $7\overline{)35}$ 5	(l) $9\overline{)72}$ 8
(m) $6\overline{)36}$ 6	(n) $2\overline{)6}$ 3	(o) $3\overline{)18}$ 6	(p) $7\overline{)49}$ 7	(q) $9\overline{)18}$ 2	(r) $4\overline{)20}$ 5
(s) $2\overline{)14}$ 7	(t) $5\overline{)25}$ 5	(u) $8\overline{)24}$ 3	(v) $7\overline{)7}$ 1	(w) $3\overline{)6}$ 2	(x) $5\overline{)35}$ 7
(y) $5\overline{)105420}$ 21084	(z) $9\overline{)972918}$ 108102	(a*) $46\overline{)56396}$ 1226	(b*) $18\overline{)42840}$ 2380		

FRACTIONS

ADD

(a) $1/2 + 1/6 =$ 2/3
(b) $1/5 + 3/5 =$ 4/5
(c) $1/2 + 1/3 =$ 5/6
(d) $1/4 + 3/4 =$ 1
(e) $1/3 + 1/4 =$ 2/7
(f) $2/5 + 1/10 =$ 1/2

SUBTRACT

(g) $1/2 - 1/4 =$ 1/2
(h) $1/6 - 1/12 =$ 1/6
(i) $2/3 - 1/6 =$ 5/6
(j) $3/5 - 1/10 =$
(k) $3/4 - 3/16 =$
(l) $5/8 - 1/4 =$

MULTIPLY

(m) $1/2 \times 1/4 =$
(n) $1/3 \times 3/4 =$
(o) $3/5 \times 2/3 =$
(p) $1/2 \times 2 =$ 1
(q) $\$30 \times 2\frac{1}{2} =$ $75
(r) $48¢ \times 3\frac{1}{4} =$ $1.92

DIVIDE

(s) $3/16 \div 3/4 =$ 15/16
(t) $7/8 \div 1/4 =$
(u) $3/4 \div 1/3 =$
(v) $4/5 \div 2/5 =$

KNOWLEDGE OF BUSINESS SITUATIONS

Check the best answer:

(1) When are prices of coal usually the lowest?

(a).....In Jan.? (b).....In Oct.? (c)....X.....In June?

(2) A man with a family takes out a $10,000 life insurance policy. Of the following reasons, which one is the best?

(a).....To pay debts in case of death. (b).....X.....To provide for wife and children. (c).....To get $10,000 at little cost.

(3) About how much does a new automobile depreciate (or lose) in value as a result of a season's use?

(a).....About 1/10. (b).....About 1/8. (c).....About 1/6.
(d).....X.....About 1/4. (e).....About 1/3. (f).....About 1/2.

(4) Buying vegetables, canned goods, and other food supplies in quantities will make possible a saving of

(a).....About 10%. (b).....X.....About 25%. (c).....About 50%.

(5) One may safely buy clothing at a bargain sale

(a).....When distinctive patterns are wanted. (b).....X.....When regular wear is planned. (c).....When work clothes are so offered.

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The Wilson General Survey Tests in Arithmetic
Form 2

By G. M. WILSON, Professor of Education, Boston University

NAME Lauvette Laventure AGE 13

TOWN Manchester, N. H. GRADE 6A

TEACHER Miss Gladys K. Stewart

To the Pupil: This is a contest covering the simple things in addition, subtraction, multiplication, division, fractions, and business knowledge. It is not a time test. Work carefully. When you have finished, check your work. Give good attention and do your best. Do not ask questions or look around. TRY TO WIN FOR YOUR SCHOOL.

SCORE FORM	
Addition	50
Subtraction	50
Multiplication	50
Division	50
Fractions	39
Business Sit.	23
TOTAL	261

ADDITION

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
7	0	7	6	8	3	8	7	3	1	8	8	4
8	7	3	7	4	9	5	7	8	7	1	6	9
15	7	10	13	12	12	13	14	11	8	9	14	13

(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)
5	$43	8	556	6755	$ 5.87	5	4	0	0	65
6	96	19	386	7657	58.16	0	7	2	5	49
11	$139	27	942	14412	$64.03	9	6	7	3	86
						14	9	8	1	89
							26	17	9	84
									18	373

SUBTRACTION

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
6	7	9	7	6	7	9	8	9	6	6	0	7	7	8
6	4	6	2	3	0	9	7	4	4	1	0	6	3	8
0	3	3	5	3	7	0	1	5	2	5	0	1	4	0

(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)	(y)	(z)	(a*)
9	3	7	4	8	135	583	6915	13390	14925	16576	16078
7	2	5	4	5	67	276	4926	1529	5643	2859	5439
2	1	2	0	3	68	307	1989	11861	9282	13717	10639

MULTIPLICATION

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
4	8	9	0	9	6	1	8	9	8
9	5	9	7	8	0	1	7	4	2
36	40	81	0	72	0	1	56	36	16

(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)
$85	47	787	569	568	$9.67	7055	25367	84689
3	8	7	9	5	9	6	403	68
255	376	5509	5121	2840	$87.03	42330	7101	677512
							00000	508134
							101478	
							10222901	5756852

DIVISION

(a) 8)72	(b) 4)24	(c) 5)5	(d) 9)81	(e) 7)56	(f) 7)0
(g) 9)54	(h) 5)40	(i) 3)15	(j) 9)63	(k) 7)42	(l) 9)18
(m) 2)8	(n) 5)20	(o) 7)28	(p) 3)27	(q) 4)28	(r) 9)36
(s) 5)45	(t) 6)48	(u) 5)35	(v) 3)12	(w) 4)32	(x) 9)9

(y) 6)126456 (21076) (z) 8)856824 (107103) (a*) 17)40460 (2380) (b*) 37)48951 (1323)

FRACTIONS

ADD

(a) $1/3 + 2/3 = 3/3$ (d) $1/2 + 1/6 = 4/6$ (g) $1/3 - 1/6 = 1/6$ (j) $3/4 - 1/8 = 5/8$

(b) $1/5 + 3/10 = 5/10$ (e) $1/8 + 6/8 = 7/8$ (h) $1/4 - 1/8 = 1/8$ (k) $2/3 - 3/15 = 7/15$

(c) $1/4 + 1/3 = 7/12$ (f) $1/2 + 1/5 = 7/10$ (i) $3/5 - 1/10 = 5/10$ (l) $5/6 - 1/3 = 3/6$

MULTIPLY

(m) $1/3 \times 3 = 4/3$ (p) $1/2 \times 1/3 = 6/6$

(n) $1/4 \times 4/5 = 80/20$ (q) $2/3 \times 3/7 = 126/21$

(o) $\$40 \times 3\frac{1}{2} = 140$ (r) $36 \times 2\frac{1}{4} = 81$

DIVIDE

(s) $5/12 \div 5/6 = 1/2$ (u) $5/6 \div 1/3 = 2/5$

(t) $2/3 \div 1/2 = 4/3$ (v) $6/8 \div 3/8 = 6/2$

KNOWLEDGE OF BUSINESS SITUATIONS

Check the best answer:

(1) In buying top of the round steak, about what does your mother pay?

(a).....10c. (b)...X....18c. (c).....30c. (d).....45c. (e).....65c. (f).....80c.

(2) What is the price of gasoline per gallon?

(a).....5c. (b).....10c. (c).....X....17c. (d).....22c. (e).....28c.

(3) What interest is paid on savings accounts?

(a).....1%. (b).....4%. (c).....6%. (d).....8%. (e)...X....10%.

(4) What is the cost of a new Ford Sedan?

(a).....$150. (b).....X....$585. (c).....$750. (d).....$848. (e).....$1200.

(5) A teacher has about $400 to invest each year. In general should she consider:

(a).....Government bonds, paying about 4¼%.

(b).....Cooperative bank, paying about 5½%.

(c)....X.....Public utility bonds, paying about 6%.

(d).....Railway stock, paying about 6½%.

(e).....Oil stock, promising about 8½%.

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The Wilson Process Inventory and Diagnostic Tests in Arithmetic

By G. M. WILSON, Professor of Education, Boston University
Assisted by Ruth Lang and other co-operators

TEST 3P. ADDITION—Process Step Difficulties

Test 3P should be used for inventory and diagnostic purposes in Grade 3, or after addition has been taught.

Name.....Age.....

Grade.....Building.....

Teacher.....

Score

.....

Town, City, or County..... Date.....

To the Pupil: Aim for 100% accuracy with reasonable speed. Remember that you are to **add** throughout the test.

If you hesitate on any step or combination, place a check (√) beside it; if you count, place two checks (√√); if you do not know, put a circle around the combination. After you have finished the test, note the time and then check the answers. When the test has been corrected, note carefully for your use in self-drill, the points on which you hesitated, counted, or made errors, according to the plan for scoring and noting errors on page 4. Work on the points that caused trouble.

Make a note of the time you begin and complete the test.

Test begun..... Test finished..... Time taken.....

Group 1 (Add):

6	7	5	2	0	4	7	5	8	8
8	5	4	9	3	8	6	8	0	8
14	12	9	11	3	12	13	13	8	16

Group 2 (Add):

18+4= 22	25+0= 25	19+8= 27	31+6= 37
27+7= 34	37+9= 46	14+7= 21	
34+1= 35	30+2= 32	28+3= 31	

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Group 3 (Add):

	4				2				4
	3	3		1	6	6	5	3	5
6	2	7	2	4	4	3	7	7	3
7	6	2	9	6	2	7	3	4	3
4	3	6	6	6	4	2	1	3	2
17	18	18	17	17	18	18	16	17	17

Group 4 (Add):

								2	
								0	
2								7	9
5			7	3	8	1	2	1	0
6	5	7	2	8	0	1	0	0	8
0	6	3	6	0	9	8	4	5	0
3	7	8	2	5	1	6	9	3	1
16	18	18	17	16	18	16	15	18	18

Group 5 (Add):

						13			
12	15	13		21		31		34	
31	11	41	125	32	23	12	13	22	624
25	32	23	211	23	44	21	51	31	162
21	41	12	542	13	11	12	24	11	112
89	99	89	878	89	78	89	88	98	898

Group 6 (Add):

20	50	2	3	6	52		1	43	40
15	7	60	40	30	6	20	1	5	58
40	40	2	12	23	10	9	17	300	101
4	701	13	40	40	10	30	40	10	400
79	798	77	95	99	78	59	59	358	599

Group 7 (Add):

35	56	43	14	296	52	6	367	257	76
473	227	167	29	119	76	18	298	158	198
468	394	585	768	499	796	484	198	286	529
976	677	795	811	914	924	508	863	701	803

Group 8 (Add):

23	78	68	76	88	60	77	78	87	88
48	64	43	98	86	78	69	96	55	79
85	97	76	73	72	84	98	8	91	50
50	9	96	46	46	55	68	70	69	75
47	78	89	74	95	85	63	46	54	99
253	326	372	367	387	362	375	398	356	391

Group 9 (Add):

$	$	$	$	$	$1.10	$	$	$	$
1.20	2.60	3.79	.48	2.48	.15	.16	4.05	.15	.45
.54	4.65	9.95	.85	1.97	6.75	4.37	1.55	4.87	2.39
8.75	9.78	3.46	1.65	.20	1.20	3.27	3.29	5.97	5.84
2.50	5.72	.85	9.78	.73	.08	4.46	6.75	7.89	3.09
1.27	.10	4.75	.60	.31	4.52	4.85	7.96	6.56	9.75
$14.26	$23.85	$22.80	$13.36	$5.69	$13.80	$17.11	$23.60	$25.44	$21.52

Group 10 (Add):

42+3+4+5+2+7=.....63.....

48+6+8=.....62.....; 45+3+1+6=.....55.....

56+7+8=.....71.....; 40+5+4+4=.....53.....

81+7=.....88.....; 72+6=.....78.....; 63+5=.....68.....

64+6=.....70.....; 56+5=.....61.....;

This closes the test. Turn back to the first page and make a note of the time taken to complete the test.

Scoring the Test. A perfect score on the test is 100. There are 100 examples, 10 in each group. In third grade or below, take off **one** for each example missed. Above the third grade, a single mistake in a group means the loss of the 10 for that group.

On the next page enter the number right for each group, and make up the total score. Above third grade count only the perfect 10's.

Summarizing Errors. After the test has been corrected, analyze the errors. Do this by determining the cause of each error and then entering a tally on the plan for analysis of errors on the next page. If the plan is not complete enough, add other items. Each pupil must know his errors and correct them.

ADDITION, PROCESS TEACHING STEP-DIFFICULTIES

Score

1. Primary combinations, sums to $9 + 9$. .....
2. Upper decade facts, sums to $39 + 9$. .....
3. Short columns, unseen addends, no zeros, sums to 18. .....
4. Short columns, unseen addends, with zeros, sums to 18. .....
5. Two place or three place numbers with no carrying, no zeros, or gaps. .....
6. Two place or three place numbers without carrying but with zeros and gaps. .....
7. Two or three addends, both 2 and 3 place, carrying, sum of left hand columns less than 10, no zeros. .....
8. Columns, carrying, gaps, zeros, sums to $39 + 9$. .....
9. Adding dollars and cents. .....
10. Higher decades needed for carrying in multiplication. .....

Record the total score here and on the first page. **Total Score** = ...

Further Analysis of Errors, Supplementing the Ten Group Steps

For each error made in the test, there should be a tally entered in the right place on this plan:

11. ..... Omitted one addend in adding.
12. ..... Reversed digits in putting down answer.
13. ..... Decade difficulty.
14. ..... Gets lost in column work above.....figures.
15. ..... Reading numbers wrongly.
16. ..... Bothered by dollar sign and decimal point.
17. ..... Failure to carry.
18. ..... Carrying wrong digit.
19. ..... Carried number put as extra in answer.
20. ..... Carrying wrong amount, too many or too few.
21. ..... Subtracting instead of adding.
22. ..... Counting.
23. ..... No regular habit, proceeding differently each time.
24. ..... Fails to observe column position.
25. ..... Derives unknown combination from familiar one.

The Wilson Process Inventory and Diagnostic Tests in Arithmetic

By G. M. WILSON, Professor of Education, Boston University
Assisted by Charles E. Huntington, Theresa Finneran, J. L. Early, H. D. Sylvester, Anna A. Murphy, and George C. Francis.

TEST 4P. SUBTRACTION—Process Step Difficulties

Test 4P should be used for inventory and diagnostic purposes in Grade 3, or after subtraction has been taught.

Name.....Age.....

Grade.....Building.....

Teacher.....

Score .....

Town, City, or County..... Date.....

To the Pupil: Aim for 100% accuracy with reasonable speed. Remember that you are to **subtract** throughout the test.

If you hesitate on any step or combination, place a check (√) beside it; if you count, place two checks (√√); if you do not know, place a circle around the combination. After you have finished, note the time and then check the answer by adding the remainder and the number to be subtracted. The sum should be equal to the minuend. When the test has been corrected, note carefully for your use in self-drill, the points on which you hesitated, counted, or made errors, according to the plan for scoring and noting errors on page 4. Work on the points that caused trouble.

Make a note of the time you begin and complete the test.

Test begun..... Test finished..... Time taken.....

Group 1

(1)	(2)	(3)	(4)	(5)
15	5	13	17	9
7	0	5	8	6
—	—	—	—	—

Group 2

(1) 35—27=

(2) 54—48=

(3) 22—18=

(4) 71—63=

(5) 46—40=

Group 3

(1)	(2)	(3)	(4)	(5)
67	837	37	864	58
51	426	22	632	31
—	—	—	—	—

Group 4

(1)	(2)	(3)	(4)	(5)
98	425	84	736	92
58	325	34	336	62
—	—	—	—	—

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Group 5

(1)	(2)	(3)	(4)	(5)
96	489	87	353	56
91	453	84	321	53
5	36	3	32	3

Group 6

(1)	(2)	(3)	(4)	(5)
498	76	754	638	82
250	40	300	102	50
248	36	454	536	32

Group 7

(1)	(2)	(3)	(4)	(5)
47	156	36	428	34
3	42	4	12	3
44	114	32	416	31

Group 8

(1)	(2)	(3)	(4)	(5)
76	972	54	428	98
38	481	38	193	79
38	491	16	235	19

Group 9

(1)	(2)	(3)	(4)	(5)
230	50	709	90	600
116	21	236	72	140
114	29	473	18	460

Group 10

(1)	(2)	(3)	(4)	(5)
71	286	58	346	85
62	193	49	275	77
9	93	9	71	8

Group 11

(1)	(2)	(3)	(4)	(5)
85	4544	235	829	66
7	916	54	53	8
78	3628	181	776	58

Group 12

(1)	(2)	(3)	(4)	(5)
927	485	6341	833	873
478	296	2186	576	385
449	189	4155	257	488

Group 13

(1)	(2)	(3)	(4)	(5)
600	2400	700	501	4800
149	1254	368	163	1432
451	1146	332	338	3368

Group 14

(1)	(2)	(3)	(4)	(5)
563	875	4842	920	631
297	396	1991	299	294
266	479	2851	621	337

Group 15

(1)	(2)	(3)	(4)	(5)
125	1607	152	1759	127
54	802	70	843	76
71	805	82	916	51

Group 16

(1)	(2)	(3)	(4)	(5)
1402	148	1812	1775	1200
804	79	926	897	940
598	69	886	878	260

Group 17

(1)	(2)	(3)	(4)	(5)
$5.40	$1.25	$42.95	$98.76	$.98
2.10	1.05	31.40	13.26	.50
$3.30	$.20	$11.55	$85.50	$.48

Group 18

(1)	(2)	(3)	(4)	(5)
$5.00	$1.00	$1.25	$55.40	$.50
1.50	.50	1.08	42.25	.39
$3.50	$.50	$.17	$13.15	$.11

Group 19

(1)	(2)	(3)	(4)	(5)
$10.00	$4.98	$10.00	$2.00	$25.00
5.98	.99	6.25	.75	17.05
$4.02	$3.99	$3.75	$1.25	$7.95

Group 20

Check the answers. Put a cross below each answer that is wrong.

(1)	(2)	(3)	(4)	(5)
486	4927	875	548	$15.00
125	4320	476	209	9.98
361 ✗	607 ✗	401 ✓	339 ✗	5.02 ✓

Turn back to the first page and make a note of the time taken to complete the test.

Scoring the Test. A perfect score on the test is 100. There are 100 examples, 5 in each group. In the third grade or below, take off one for each example missed. Above the third grade, a single mistake in a group means the loss of the 5 for that group. On the next page, enter the number right for each group, and make up the score. Above the third grade, count only the perfect 5's.

Summarizing Errors. After the test has been corrected, analyze the errors. Do this by determining the cause of each error, and then entering a tally on the plan for analysis of errors on the next page. If the plan is not complete enough, add other items. Each pupil must know his errors and correct them.

PLAN FOR SCORING AND NOTING ERRORS

Groups

1. Primary facts. .....
2. Related short division subtractions. .....
3. Simple subtractions, without borrowing. .....
4. Two or three place numbers, no borrowing, zero in answer. .....
5. Two or three place numbers, no borrowing, last subtraction a zero not brought down. .....
6. Two or three place numbers, no borrowing, zeros in subtrahend. .....
7. Gaps, or dangling lefts, no borrowing. .....
8. Two or three place numbers, one-step borrowing. .....
9. Zero in the minuend and one-step borrowing. .....
10. One-step borrowing, the last subtraction a zero not brought down. .....
11. Gaps, or dangling lefts, with borrowing. .....
12. Double borrowing. .....
13. Zeros in the minuend and double borrowing. .....
14. Double borrowing, involving the figure nine in the subtrahend. .....
15. Vanishing lefts, and borrowing. .....
16. Vanishing lefts with double or triple borrowing. .....
17. Dollars and cents, zero difficulties, no borrowing .....
18. Dollars and cents with zero difficulties and one-step borrowing. .....
19. Dollars and cents with double or triple borrowing, zeros, gaps, and vanishing lefts. .....
20. Checking answers. .....

Record score here and on first page. **Total score** .....

Analysis of Errors

For each error made in the test, there should be a tally entered in the right place on this plan.

21. ..... Adding instead of subtracting.
22. ..... Borrowing, failing to borrow when necessary.
23. ..... Borrowing from second figure to left instead of first.
24. ..... Borrowing, increasing instead of decreasing minu end digit.
25. ..... Borrowing, not taking one away when borrowed.
26. ..... Borrowing, the one borrowed added as a unit.
27. ..... Borrowing too many; e. g., 2 or 3 instead of 1.
28. ..... Borrowing, when unnecessary.
29. ..... Combination errors, minuend under 10.
30. ..... Combination errors, minuend 10 to 18.
31. ..... Counting.
32. ..... Cross subtraction.
33. ..... Lefts, dangling lefts ignored.
34. ..... Lefts, vanishing lefts brought down.
35. ..... Minuend figure brought down.
36. ..... Minuend, one figure of minuend taken from subtrahend.
37. ..... Process not understood.
38. ..... Remainder figures reversed.
39. ..... Remainder, one borrowed put as next figure in remainder.
40. ..... Subtrahend figure brought down.
41. ..... Subtracting units only.
42. ..... Unknown combinations derived from known.
43. ..... Zero, when remainder is 0, bringing down figure of subtrahend or minuend.
44. ..... Zero, subtracting some number from 0 = 0.
45. ..... Zero, subtracting some number from 0 = subtrahend figure.
46. ..... Zero subtracted from some number = 0.
47. ..... Other zero difficulties.

The Wilson Process Inventory and Diagnostic Tests in Arithmetic

By G. M. WILSON, Professor of Education, Boston University
Assisted by J. J. Early, Catherine M. Tasker, and Ruth E. Fitzsimmons

TEST 5P. MULTIPLICATION—Process Step Difficulties

Test 5P should be used for inventory and diagnostic purposes as soon as multiplication has been completely taught, usually by the close of Grade 4, or any later grade.

Name.....Age.....

Grade.....Building.....

Teacher.....

Score .....

Town, City, or County..... Date.....

To the Pupil: Aim for 100% accuracy with reasonable speed. Remember that you are to **multiply** throughout the test.

If you hesitate on any step or combination, place a check (√) beside it; if you count, or say the tables, place two checks (√√); if you do not know, place a circle around the combination. After you have finished, note the time and then check the answers. When the test has been corrected, note carefully for your use in self-drill, the points on which you hesitated, counted, or made errors, according to the plan for scoring and noting errors on page 4. Work on the points that caused trouble. Make a note of the time you begin and complete the test. You may, if you wish, figure on an extra sheet of paper. If you do this, you should save the sheet for use in detecting errors.

Test begun..... Test finished..... Time taken.....

Group 1 (Multiply):

8	7	4	2	4	7	2	4	8	6
6	3	9	7	1	5	3	2	4	7
—	—	—	—	—	—	—	—	—	—

Group 2 (Multiply)

7	4	0	4	0	3	5	4	8	0
0	5	8	4	1	4	2	0	9	5
—	—	—	—	—	—	—	—	—	—

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Group 3 (Multiply):

70 × 6	413 × 2	423 × 3	51 × 4	82 × 2
642 × 2	$7.10 × 3	62 × 4	83 × 1	91 × 7

Group 4 (Multiply):

135 × 2	86 × 3	97 × 4	71 × 7	53 × 9
379 × 2	53 × 7	419 × 5	$1.25 × 6	49 × 4

Group 5 (Multiply):

67 × 9	68 × 6	$2.50 × 4	13 × 8	76 × 7
27 × 8	$3.65 × 6	78 × 8	$1.98 × 5	378 × 3

Group 6 (Multiply):

$.50 × 5	501 × 6	408 × 4	105 × 8	390 × 4
607 × 9	$8.05 × 7	206 × 3	402 × 4	$7.50 × 6

Group 7 (Multiply):

51 × 25	62 × 34	71 × 43	923 × 21	80 × 17

7 4 1 2	3 4 2 2 1	6 2 1 1 4	2 3 0 2 3	1 3 2 2 2 2

Group 8 (Multiply):

8 5 4 7	5 0 6 1 2 9	9 3 8 9	6 8 7 6	$ 9.3 0 2 9

8 9 6 8 3	5 4 3 9	7 8 4 3 6 7	3 6 1 7	9 2 5 6

Group 9 (Multiply):

6 8 4 0	4 3 5 3 0 8	9 2 4 9 0 6	7 4 5 4 0 5	5 4 2 7 0

7081 509	840 690	$5.90 10	915 504	$7.50 20

Group 10 (Multiply):

$.27 100	700 60	693 600	$16.80 300	950 2000

$680 120	$1.05 20	8302 805	$700.95 4	842 2100

Scoring the Test. A perfect score on the test is 100. There are 100 examples, 10 in each group. In the fourth grade or below, take off one for each example missed. Above the fourth grade, a single mistake in a group means the loss of the 10 for that group. On the next page, enter the number right for each group, and make up the score. Above the fourth grade, count only the perfect 10's.

Summarizing Errors. After the test has been corrected, analyze the errors. Do this by determining the cause of each error, and then entering a tally on the plan for analysis of errors on the next page. If the plan is not complete enough, add other items. Each pupil must know his errors and correct them.

PLAN FOR SCORING AND NOTING ERRORS

1. Primary combinations, no zeros. .....
2. Primary combinations, including zeros. .....
3. One place multiplier, no carrying (dollars and cents). .....
4. One place multiplier, carrying requiring addition in same decade (dollars and cents). .....
5. One place multiplier, carrying requiring addition in higher decade (dollars and cents). .....
6. One place multiplier, zeros in multiplicand with and without carrying into zero (dollars and cents). .....
7. Two or three place multiplier, no carrying (dollars and cents). .....
8. Two or three place multiplier, with carrying (dollars and cents). .....
9. Single zeros in multiplier (dollars and cents). .....
10. Double zeros in multiplicand or multiplier (dollars and cents). .....

Record total score here and on first page. **Score** = ...

Analysis of Errors

For each error made in the test, there should be a tally entered in the right place on this plan.

11. ..... Addition combination errors in carrying.
12. ..... Combination errors in adding partial products.
13. ..... Carried wrong number.
14. ..... Forgot to carry.
15. ..... Errors in carrying into zero.
16. ..... Put carried number in product.
17. ..... Columns confused in adding partial products.
18. ..... Multiplication, combination facts.
19. ..... Multiplying by zero—number multiplied.
20. ..... Misplacement in writing partial products.
21. ..... Omitting zeros in partial product.
22. ..... Omitting one figure of multiplier.
23. ..... Omitting one figure of multiplicand.
24. ..... Switching multipliers.
25. ..... Decimal point omitted or misplaced in product (U. S. money).
26. ..... Used wrong process, added or subtracted.
27. ..... Counted or said tables to get multiplication facts.

The Wilson Process Inventory and Diagnostic Tests in Arithmetic

By G. M. WILSON, Professor of Education, Boston University
Assisted by Katherine F. Horrigan, C. Delia Jennings, and Louise Wingate

TEST 6 P 1. SHORT DIVISION—Process Step Difficulties.

Test 6 P1 should be used for inventory and diagnostic purposes as soon as division has been completely taught, usually by the middle of Grade 4, or in any later grade.

Name.....Age.....

Grade.....Building.....

Teacher.....

Score

.....

Town, City, or County..... Date.....

To the Pupil: Aim for 100% accuracy with reasonable speed. Remember that you are to **divide** throughout the test.

If you hesitate on any step or combination place a check (√) beside it; if you count or say the tables, place two checks (√√); if you do not know, place a circle around the combination. After you have finished the test, note the time and then check the answers. When the test has been corrected, note carefully for your use in sell-drill, the points on which you hesitated, counted, or made errors, according to the plan for scoring and noting errors, on page 4. Work on the points that caused trouble. Make a note of the time you begin and complete the test.

Test Begun..... Test Finished..... Time Taken.....

Group 1 (Divide):

7)21	5)45	9)81	6)42	4)36
8)72	3)$15	7)63	2)16	9)0

Group 2 (Divide):

5)49	8)7	4)37	7)3	8)27
2)$11	9)89	8)57	7)26	6)20

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Group 3 (Divide):

3)6 6	4)8 4	6)3 0 6	3)9 6 6	7)1 4 7
9)5 4 9	7)4 9 7	5)$4 0 5	6)4 8 6	3)1 5 3

Group 4 (Divide):

9)1 8 6	7)6 3 8	3)9 6 4	4)4 7	7)2 8 9
5)$1 5 2	6)1 8 7	8)4 0 9	7)1 4 8	6)1 2 7

Group 5 (Divide):

5)6 5	7)8 4	9)1 8 9
9)4 8 6	7)1 6 1	5)9 2 5
3)1 2 6	9)5 5 8	8)6 5 8 4

Check the answer and prove

89

3)267

The right answer is

.....

Group 6 (Divide):

4)5 7	9)1 7 5	7)1 3 3
9)1 5 5 8	4)9 9 7	6)4 7 2
2)2 3 2	3)2 6 7	8)1 8 2

Check the answer and prove

39-1R

3)118

The right answer is

.....

Group 7 (Divide):

7)2107	9)36045	8)64016	6)36042	4)32008
8)4808	7)14042	9)72018	8)1608	2)$208.50

Group 8 (Divide):

4)4 0 1 6	6)7 2 0 6	9)2 8 8 0 9
7)$9 8 8 4	3)1 6 8 2 7	4)$2 0.2 8
5)4 8 0 8 5	6)1 1 4 0 3 6	7)1 5 4 0 7

Check the answer and prove

22009
5)110045

The right answer is .....

Group 9 (Divide):

2)1 9 0 0 3	5)$1 5 0.1 0	9)2 3 4 0 1 0
3)1 1 7 0 6	4)6 4 0 1 4	5)5 0 1 8
8)4 8 0 8	6)1 0 2 0 3 8	6)6 0 1 5

Check the answer and prove

1850-3R
7)13003

The right answer is .....

Group 10 (Divide):

5)$1 5.5 0	4)2 4 8 0	7)2 8 0 3
7)6 3 1	6)5 4 4 2 0	9)8 9 1 0
9)5 4 0 5	3)3 6 3 0	8)6 4 0 2

Check the answer and prove

1600-4R
6)9604

The right answer is .....

Turn back to the first page and make a note of the time taken to complete the test.

Scoring the Test. A perfect score on the test is 100. There are 100 examples, 10 in each group. In the fourth grade or below, take off one for each example missed. Above the fourth grade, a single mistake in a group means the loss of the 10 for that group.

On the next page, enter the number right for each group, and make up the score. Above the fourth grade, count only the perfect 10's.

Summarizing Errors. After the test has been corrected, analyze the errors. Do this by determining the cause of each error, and then entering a tally on the plan for **analysis of errors** on the next page. If the plan is not complete enough, add other items. Each pupil must know his errors and correct them.

PLAN FOR SCORING AND NOTING ERRORS

1. Primary combinations, to 81 ÷ 9, no remainders. .....
2. Uneven combinations, to 89 ÷ 9. .....
3. Two or more digits in quotient, no carrying, no remainders. .....
4. Two or more digits in quotient, no carrying, but with remainders. .....
5. Two or more digits in quotients, with carrying, no remainders. .....
6. Two or more digits in quotient, with carrying, and with remainders. .....
7. One and two zeros in quotient, no carrying, no remainders. .....
8. One and two zeros in quotient, with carrying. .....
9. One or more zeros in quotient, with carrying, and with remainders. .....
10. Final zero in quotient, with and without remainders. .....

Record the score here and on first page. Total score = ...

Analysis of Errors

For each error made in the test, there should be a tally entered in the right place on this plan.

11. ..... Mistakes in primary division facts (0's....., 1's....., 2's....., 3's....., 4's..... 5's....., 6's....., 7's....., 8's....., 9's.....)
12. ..... Complete ignorance of process of division.
13. ..... Used a dividend digit twice.
14. ..... Neglecting a digit of dividend within problem.
15. ..... Failure to divide when partial dividend is equal to divisor.
16. ..... Wrong placing of first quotient figure.
17. ..... Extra figure or zero added at close of quotient for no apparent reason.
18. ..... Extra figure or zero added within quotient.
19. ..... Carrying to answer a figure in mind, as 37 ÷ 7 = 7, 48 ÷ 8 = 8, 27 ÷ 3 = 7.
20. ..... Did not complete division (as last step).
21. ..... Failure to bring down a final zero in quotient.
22. ..... Omitting zero in quotient when dividend digit will not contain divisor.
23. ..... Zero ÷ by some number = that number or 1.
24. ..... Zero ÷ by some number, nothing placed in quotient.
25. ..... Remainder omitted, at close.
26. ..... Remainder ignored, within problem.
27. ..... Wrote remainders within problem.
28. ..... Using a remainder within a problem larger than divisor (quotient figure too small).
29. ..... Remainder at close larger than divisor.
30. ..... Subtraction wrong, giving wrong remainder to carry.
31. ..... Failure to subtract to get remainder.
32. ..... Carrying, failure to, in uneven division.
33. ..... Carrying when division is even.
34. ..... Errors in multiplication, as shown in having pupil go over example orally.
35. ..... Confused by U. S. money, dollar sign, and decimal point.
36. ..... Failure to place decimal point or placing it incorrectly.
37. ..... Inability to check short division.

The Wilson Process Inventory and Diagnostic Tests in Arithmetic

By G. M. WILSON, Professor of Education, Boston University
Assisted by Katherine F. Horrigan, C. Delia Jennings, Louise Wingate, J. L. Early, Margaret J. O'Brien, Dorothy E. Connor, and Cora M. Walker

TEST 6 P2. LONG DIVISION—Process Step Difficulties.

Test 6 P2 should be used for inventory and diagnostic purposes as soon as long division has been completely taught, usually by the end of Grade 5, or in any higher grade.

Name.....Age.....

Grade.....Building.....

Teacher.....

Score

.....

Town, City, or County..... Date.....

To the Pupil: Aim for 100% accuracy with reasonable speed. Remember that you are to **divide** throughout the test.

If you hesitate on any step or combination, place a check (√) beside it; if you count or say the tables, place two checks (√√); if you do not know, place a circle around the combination. After you have finished the test, note the time and then check the answers. When the test has been corrected, note carefully for your use in self-drill, the points on which you hesitated, counted, or made errors, according to the plan for scoring and noting errors on page 4. Work on the points that caused trouble. Make a note of the time you begin and complete the test. You may, if you wish, figure on an extra sheet of paper. If you do this, you should save the sheet for use in detecting errors.

Test begun..... Test finished..... Time taken.....

Group 1 (Divide):

21)4 4 1 30)$6.9 0 41)4 1 0

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32)3 8 7 2

31)1 3 9 9 9 6

Group 2 (Divide):

72)7 9 6

51)5 6 9 3

31)6 8 7 4

21)6 7 4 9

32)7 6 9

Group 3 (Divide):

Check the answer:

```
      4 3
    -----
4 1)1 7 7 5
    1 6 4
    -----
      1 3 5
    . 1 2 3
    -------
        1 2 Rem.
```

52)1 1 9 8

61)1 9 7 4 32)1 3 1 2 71)3 0 5 8

Group 4 (Divide):

28)3 9 2 34)2 0 7 4 45)$3 1.5 0

47)1 5 9 8 23)1 1 9 6

Group 5 (Divide):

91)3 9 1 5 73)2 4 0 9 81)5 5 0 8

42)1 0 0 8 61)5 1 8 5

Group 6 (Divide):

$54\overline{)4\ 9\ 1\ 4}$ $63\overline{)2\ 3\ 9\ 4}$ $59\overline{)1\ 3\ 5\ 7}$

$73\overline{)3\ 3\ 5\ 8}$ $64\overline{)3\ 4\ 4\ 5}$

Group 7 (Divide):

$111\overline{)8\ 9\ 9\ 1}$ $121\overline{)1\ 4\ 8\ 9\ 5\ 1}$ $131\overline{)2\ 7\ 5\ 1}$

$1122\overline{)1\ 3\ 5\ 7\ 6\ 2}$ $222\overline{)6\ 9\ 2\ 6\ 4}$

Group 8 (Divide):

Check the answer:

$$
\begin{array}{r}
412 \\
\hline
36\overline{)14840} \\
144 \\
\hline
44 \\
36 \\
\hline
80 \\
72 \\
\hline
8\ \text{Rem.}
\end{array}
$$

$64\overline{)3\ 2\ 7\ 5\ 0}$

74)2 7 4 0 47)4 3 0 0 32)$1 7 7.0 0

Group 9 (Divide):

Check the answer:

```
      40
   ------
67)2707
   268
   ---
     27 Rem.
```

26)1 8 4 6 0

83)7 6 3 6 0 70)1 7 4 0 74)5 1 8 3 7 0

Group 10 (Divide):

14)$8.4 0 52)3 5 8 8 45)3 5 5 5

98)9 0 1 6 66)5 2 1 4

B.H.239 91 12

Eleanor Bolser 10010 13 — **Composite Test II** — Youngsville — Miss Stewart — 9:15 a.m. − 9:48 = 33 min. (IIC)

Name:	Age:	School	Teacher	Time

Add:

6	37	13	2	367	14	43	88	43	$1.10
+8	9	31	0	298	29	5	79	5	.15
14	46	12	7	198	768	300	50	1	6.75
		21	1	863	811	10	75	6	1.20
		12	0			358	99	55	.08
		89	5				391		4.52
			3						$13.80¢
			18						

Subtract:

17	71	837	736	54	47	6341	2400	1607	$98.76
−9	63	426	336	38	3	2186	1254	802	13.26
8	8	411	400	16	44	4155	1146	805	$85.50¢

Multiply:

6	390	607	501	621	230	924	7060	7081	$7.50
×8	4	4	6	14	23	906	6	509	20
48	1560	2428	3006	2484	690	5544	42360	63729	$150.00
				621	460	8316		35405	
				8694	5290	837144		3604229	

Divide:

7	3 R6	61	22 R6	601	6007	823	5609	990	$30.02¢
6|42	7|27	9|549	8|182	8|4808	6|36042	8|6584	3|16827	9|8910	5|$150.10

Divide:

10	14	248 R1	61	33	21	81	312	121	$ .79¢
41|410	28|392	32|769	34|2074	73|2409	131|2751	111|8991	222|69264	1122|135762	45|$35.55
410	28	64	204	219	262	888	666	1122	315
00	112	129	34	219	131	111	266	2356	405
	112	128	34	0	131	111	222	2244	405
	0	1R	0		0	0	444	1122	0
							444	1122	
							0	0	

Composite Test IIc

CI

10076 Name: Minnie Petrocchi | School: Youngsville | Teacher: Miss L. K. Stewart | Age: 11 | Time: 8:55 a.m. – 9:18

23 min

Add:

4	27	34	9	296	6	42	20	78	$1.20
8	7	22	0	119	18	3	9	64	.54
12	34	31	8	499	484	4	30	97	8.75
		11	8	914	508	5	59	9	2.50
		98	0			2		78	1.27
			1			7		326	$14.26
			18			63			

Subtract:

15	58	425	34	709	4544	875	501	920	$5.40
7	31	325	3	236	916	385	163	299	2.10
8	27	100	31	473	3628	490	338	621	$3.30

Multiplication:

4	70	53	408	923	68	693	435	390	$7.10
9	6	9	4	21	40	600	308	4	3
36	420	477	1632	923	2720	415800	3480	1560	$21.30
				1846			000		
				19383			1305		
							33980		

Short Division:

3	3	322	75	4005	14	1004	78	$5.07	$81
7|21	6|20	3|966	8|601	9|36045	4|57	4|4016	6|472	4|$20.28	5|$405
	2R.		1R.		1R.		4R.		

Long Division:

21	10	221	121	33	1231	11	68	$.70
21|441	41|410	31|6874	32|3872	73|2409	121|148951	72|796	81|5508	45|$31.50
42	41	62	32	219	121	72	486	315
21	000	67	67	0219	279	76	648	0000
21		62	64	219	242	72	648	
00		54	32	000	375	4	000	
		31	32		363			
		23	00		121			
					121			
					000			

23R. | 14\|840 | 84 | 00 | 60

Composite Test I

100 C. III

Name: Stella Kliaz Age: 11 School: Bakersville Teacher: Miss Hurley Time: 8:46 = 9:01

Add:

3	42	33	8	243	5	40	14	76	$1.25
+9	8	32	0	117	20	5	6	62	.50
12	50	10	2	269	596	3	•20	96	6.76
		4	3	629	621	8	40	9	2.38
		79	4			2		86	1.27
			17			6		329	$12.76
						64			

Subtract:

16	68	435	38	708	4654	877	601	930	$6.80
−6	21	235	7	305	918	375	184	289	2.25
10	47	200	31	403	3736	502	417	641	$4.55

Multiply:

5	80	63	408	832	76	762	445	490	$9.20
×7	5	9	6	31	40	600	208	15	4
35	400	567	2448	832	3040	457200	3560	2450	$36.80
				2496			8900	490	
				25792			92560	7350	

Divide:

3	7	233	21/6	52 1/8	3007	16 1/4	525/9	41	$5.01
8|24	7|49	3|699	6|143	8|417	9|27063	4|65	9|473	5|205	4|$20.04

Divide:

41	20	32 2/31	110	120 5/28	602	2	19 4/7	$2.21	32 1/3
11|451	41|820	31|995	72|7920	28|3365	15|9030	81|162	21|266	45|$99.45	31|993
44	82	93	72	28	90	162	21	90	93
11	00	65	72	56	03	0	56	94	63
11	00	62	72	56	00		42	90	62
0	0	3	00	00	30		14	45	1
			00	5	30			8	
			0		0				

Composite Test I

BOSTON UNIVERSITY
1 1719 02544 1504